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Journal of the Royal Society of Arts

NO. 5065 DECEMBER 1961 VOL. CX

TWO HUNDRED AND EIGHTH SESSION 1961–62

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A list of Standing Committees for 1961–62 is published on pages 63–67 of this issue

FORTHCOMING MEETINGS

FRIDAY, 1ST DECEMBER, **at 7.30 p.m.** Film Evening. The programme will include *Seawards the Great Ships*, *The Captive River* and *The Living Soil*; for full details see November *Journal*, p. 909.)

MONDAY, 4TH DECEMBER, **at 6 p.m.** The last of three CANTOR LECTURES on '*Some Problems of British Export Trade*', entitled '*Overseas Marketing*', by Roger Falk, O.B.E., Chairman, Marketing Development Co. Ltd. Sir Walter Worboys, D.Phil., B.Sc., Chairman, B.T.R. Industries Ltd., and a Member of Council of the Society, in the Chair.

TUESDAY, 5TH DECEMBER, **at 2.30 p.m.** COMMONWEALTH SECTION. '*The Design and Manufacture of Postage Stamps in the Commonwealth*', by John Easton, Chairman, Robert MacLehose & Co. Ltd. Sir John Wilson, Bt., K.C.V.O., Keeper of The Queen's Philatelic Collection, in the Chair. (The paper, which will be illustrated, has been arranged particularly for younger people (aged 15-18), on whose behalf Fellows are invited to apply for tickets. Tea will be served in the Library after the meeting.)

WEDNESDAY, 6TH DECEMBER, **at 2.30 p.m.** '*The Duke of Edinburgh's Award Scheme*', by Sir John Hunt, C.B.E., D.S.O., Director, The Duke of Edinburgh's Award. Sir George Edwards, C.B.E., B.Sc., a Vice-President of the Society, in the Chair.

WEDNESDAY, 13TH DECEMBER, **at 6 p.m.** '*Tin: its Contribution to Social Development*', by E. S. Hedges, Ph.D., D.Sc., F.I.M., F.R.I.C., Director, International Tin Research Council. The Right Honble. Viscount Chandos, P.C., D.S.O., M.C., Chairman, Associated Electrical Industries Ltd., in the Chair. (The paper will be illustrated by lantern slides.)

FRIDAY, 29TH DECEMBER, **at 2.30 p.m.** DR. MANN JUVENILE LECTURE. '*Machines That Think*', by A. D. Booth, Ph.D., D.Sc., of Birbeck College, University of London. (Refreshments will be served after the Lecture. Special tickets of admission are required; see notice on p. 3.)

WEDNESDAY, 3RD JANUARY, **at 2.30 p.m.** EDMUND RICH JUVENILE LECTURE. '*The Young Artist*', by Mervyn Levy, A.R.C.A. (Refreshments will be served after the Lecture. Special tickets of admission are required; see notice on p. 3.)

FRIDAY, 5TH JANUARY, **at 6.30 p.m.** Film Evening. (See programme on p. 3.)

WEDNESDAY, 10TH JANUARY. **at 2.30 p.m.** POPE MEMORIAL LECTURE. '*Modern British Drugs*', by Frank Hartley, B.Sc., Ph.D., Director of British Drug Houses Limited. Sir Howard Florey, P.R.S., Professor of Pathology, University of Oxford, in the Chair.

WEDNESDAY, 17TH JANUARY, **at 6 p.m.** '*The Plumage of the (Human) Male*', by James Laver, C.B.E. John Taylor, Editor, *The Tailor & Cutter*, in the Chair. (The paper will be illustrated.)

WEDNESDAY, 24TH JANUARY, **at 2.30 p.m.** '*The Contribution of the Society to Industrial Design*', by John Gloag, Hon.A.R.I.B.A., Hon.F.S.I.A., a Member of Council of the Society.

TUESDAY, 30TH JANUARY, **at 5.15 p.m.** COMMONWEALTH SECTION. '*From the Ends of the Earth: Overseas Students in Britain*', by Miss Mary Trevelyan, O.B.E., A.R.C.M., A.R.C.O., Adviser to Overseas Students, University of London. Her Grace the Dowager Duchess of Devonshire, G.C.V.O., C.B.E., Deputy President, The Victoria League, in the Chair. (Tea will be served in the Library from 4.30 p.m.)

WEDNESDAY, 31ST JANUARY, **at 6 p.m.** '*The Poster in Modern Advertising*', by Abram Games, O.B.E., R.D.I., F.S.I.A. The Right Honble. Lord Conesford, Q.C., Past President, Design and Industries Association, and a Member of Council of the Society, in the Chair. (The paper will be illustrated.)

Fellows are entitled to attend any of the Society's meetings without tickets (except where otherwise stated), and may also bring two guests. When they cannot accompany their guests, Fellows may give them special passes, books of which can be obtained on application to the Secretary.

Official representatives of Companies in association with the Society may also attend, with one guest.

JUVENILE LECTURES

Special tickets of admission for the Juvenile Lectures announced on page 2 will shortly be ready. They will be sent to Fellows on request to the extent permitted by the accommodation in the Lecture Hall.

Fellows are entitled to apply for tickets admitting one adult and two children to each lecture, and should state their exact requirements within these limits when applying.

FILM EVENING

The second Film Evening of the Session will be held on Friday, 5th January, **at 6.30 p.m.** and, as is customary on this particular occasion, the programme has been chosen to interest especially the older children of Fellows. The following films will be screened:

Hazard
On Safari with Armand and Michaela Denis
State Opening of Parliament
Hors d'Oeuvre

Hazard (36 minutes), which is in colour, is an exciting account of a mountaineering expedition in the Dolomites and of carelessness which leads to disaster.

It was made for the British Iron and Steel Federation by Tom Stobart in the interests of accident prevention, whether on the mountainside or in the factory. This film has won many awards, including the Diploma of Merit at Edinburgh in 1960, and the Catholic Film Centre Presentation at Cortina and first prize for an industrial safety film at Turin this year.

On Safari (20 minutes), also in colour, was produced by Armand Denis for the Dunlop Film Library, and is a study of wild life in East Africa made, at some risk to themselves, by Mr. and Mrs. Denis. The creatures watched include a leopard, lions, crocodiles, hippopotamus, baboons, and several species of birds, notably flamingoes and pelicans—the latter performing a strange water dance.

State Opening of Parliament (20 minutes) is a colour film made in 1960 by World Wide for the Central Office of Information, primarily for overseas distribution. It records the splendour and majesty which attend The Queen when she comes to sit with her Great Council of Parliament and endow law-making with the authority of her Crown. Beginning with the State drive from Buckingham Palace, it covers the whole of the ceremony in the House of Lords. This film was selected for the 1961 Royal Command Performance and gained the 1961 Council of Europe Newsreel Award.

Hors d'Oeuvre (8 minutes), made for the National Film Board of Canada, is simply a high-spirited selection of snippets, including cartoons, from a number of credit titles made for Canadian Television presentations.

On this occasion light refreshments will be served *before* the programme, from 5.45 p.m. Tickets of admission are not required and Fellows are entitled to introduce two guests.

PRESENTATION OF THE ALBERT MEDAL

His Royal Highness the Duke of Edinburgh, President of the Society, presented the Albert Medal for 1961 to Dr. Walter Gropius at Buckingham Palace on 7th November. As announced in the July issue of the *Journal*, the medal was awarded to Dr. Gropius 'for his contributions to architectural and industrial design'.

Dr. Gropius was accompanied by his wife, and the following present and former Members of the Council also had the honour of being received by the President on this occasion: Lord Nathan (Chairman); Mrs. Mary Adams; Lord Bossom; the Honble. G. C. H. Chubb; Lord Conesford; Mr. R. E. Dangerfield; Mr. Geoffrey de Freitas; Sir George Edwards; Mr. P. A. Le Neve Foster; Mr. John Gloag; Sir Ernest Goodale; Professor R. Y. Goodden; Mr. Milner Gray; Dr. R. W. Holland; Mr. J. C. Jones; Sir Harry Lindsay; Mr. Sidney Loweth; Mr. F. A. Mercer; Mr. Oswald P. Milne; Sir Ronald Nesbitt-Hawes; Mr. Brian O'Rorke; Mr. A. R. N. Roberts; Professor S. Tolansky; Mr. Hugh A. Warren; Sir Harold Wernher, and Sir Walter Worboys; with Mr. G. E. Mercer (Deputy Secretary).

FUNCTIONS IN HONOUR OF DR. WALTER GROPIUS

On Tuesday, 7th November, the Faculty of Royal Designers for Industry gave a cocktail party at the Society's House to meet Dr. Walter Gropius, Hon.R.D.I., and his wife.

On the following Thursday, the Council gave a dinner party in honour of Dr. Gropius. The Chairman, Lord Nathan, presided, and the guests included Mrs. Gropius, Mr. G. Lewis Jones, Minister at the American Embassy, Mr. Henry Brooke, M.P. (formerly Minister of Housing and Local Government), Frau Dr. B. Lohmeyr, Federal German cultural attaché in London, Sir William Holford, President of the R.I.B.A., Mr. M. A. Austin-Smith, President of the Architectural Association, Sir Hugh Casson, Sir Gordon Russell, Sir Basil Spence, Mr. Jack Cotton, Mr. Benjamin Thompson, Dr. Gropius's partner, and others closely concerned with architecture and the arts of design. In an after-dinner speech, Dr. Gropius expressed his deep sense of the honour done to him by the bestowal of the Albert Medal, and continued:

In gratitude I should entertain you now with one of those witty after-dinner speeches as I have enjoyed them myself on many occasions in this country. But they are, alas, an inimitable British product, and foreign imitation usually lacks the easy grace, the casual tone and the well balanced approach for which they are rightly famous.

Adding to my predicament is an unsettling experience I have had just recently with the problem of interpreting one's thought into another idiom. I found myself staring in disbelief at the German translation of a paper I had innocently composed in English for Columbia University, New York, and which had seemed quite acceptable to me at the time. But when it was deprived of the pleasantly mysterious disguise of the English language and came at me in the unmistakable sounds of my native tongue, I was appalled at finding it studded with clichés and full of semantic loopholes. It had to undergo a drastic repair before I felt I could offer it to a German audience.

After this confession, you will understand my misgivings whenever I undertake to express my thoughts and feelings in English again. I hope to convey to you, though, my deep appreciation of the interest your Society has shown in my work and of the magnanimity of your response to it.

Since this concerns the development in theory and practice of an idea which began taking shape in my mind 50 years ago, I should be able to reminisce a little with you on the ups and downs, the victories and defeats this idea encountered during its slow but steady growth, but, as some publishers have already found out to their annoyance, I am a very poor prospect in this respect for, to this day, I have been unable to recapitulate and reassess my own life in a biography, mainly because I was too busy living it. I also have my doubts whether anybody looking back on his own history can truly relate the impact of events on his mind or, conversely, the impact his mind had on events. After all, he has reached another phase of life, he lives in a changed emotional climate, and his present vision is conditioned by new experiences, new horizons.

For instance, some time ago I was visited by a German art historian who is in the process of writing a detailed and well-documented account of the Bauhaus years

between 1919-1928. In the course of our searching through old files, we came upon a diary my wife had kept throughout the last six years in Weimar and Dessau which we had never re-examined since. I began reading it, and the farther I proceeded the more I became depressed, for it became perfectly clear to me from the text that of all the tremendous effort put into that enterprise 90 per cent had gone towards fighting the hostile forces of the local and national environment, and less than 10 per cent had been spent on creative work. Mind you, the depression I now experienced at this discrepancy had never been felt at the time, except for short intervals; it was only in retrospect that the overwhelming odds against the continuation of an institution, dedicated to a completely unorthodox, revolutionary approach to design, became apparent in their full extent. While we were at it we knew perfectly well that we had to wrest every bit of our existence from the lion's mouth, but we never doubted our strength to overcome opposition. We were fighting mad at being hampered in our work, but we were not depressed. We felt we were standing at a new beginning and had accomplished only the first few steps into a newly discovered world full of challenges and promises.

Armed with my present knowledge, I would have said that it could *not* be done, that the short interlude between the end of World War One and Hitler's advent was much too short to accomplish anything of lasting value; that the long hibernation into which all creative minds were forced during the Nazi years would surely have killed off the carefully sown seed. And yet, here I am, 28 years after my exodus from Germany, picked out by you as the representative of all those who weathered those early years with me, to receive your highest prize for leadership in design.

So, don't you ever believe an old man when he says that something cannot be done; he cannot possibly put himself back into the shoes of a young man who simply goes to work confidently setting the stage as if he were going to live forever. It is only by this stretch of his imagination that he can thrust his thoughts ahead far enough to outlast his lifetime.

Well, whatever did become possible during those hard-pressed years when teachers and students at the Bauhaus worked in a kind of collaboration which had never been tried before, has now been concentrated in the newly created Bauhaus Archiv in Darmstadt, Germany, with the Prinz zu Hesse und Rhein as President and supported by the Bonn Government and by the City of Darmstadt. There all the documents and quite a few of the original products have been brought together to allow those interested in the development and the subsequent spread of this movement to get a first-hand glimpse at it. I had myself collected all comments made in the press, hostile and otherwise, at the time and this alone provides an interesting study of the climate of the '20s and '30s and the resulting political and cultural interaction. Legend has thereby been transformed into comprehensible reality and doesn't have to rely any more on individually biased reminiscences of the participants or on hearsay. To me, personally, it has come as a great relief to be able to refer interested scholars, educators and artists to this collection of source material, since I have found it increasingly difficult constantly to have to give evidence about my past while I am still so involved with the present.

The Bauhaus Archiv itself, of course, does not want to confine its task only to the documentation of its own past and its later influence on others, but endeavours to become a centre for the study of living art, architecture and design through exhibitions, books and lectures.

You may wonder how these ideas can make their way to-day in a period which, far from being dominated by the artist, does not even reflect the desires of the manufacturer, nor for that matter the public demand, but is characterized by the power of the sales propagandist, of what your Mr. Toynbee calls the 'Tempter', or what in the States are called 'the Madison Avenue boys'. Under this régime it seems completely futile to inject quality into buildings and goods which are created only

for their short entertainment value before they are discarded or exchanged for another set of equally ephemeral items.

I remember how struck I was by this, our modern predicament, when, during my visit in Japan, I entered a Tokyo department store and found myself presented with two entirely different sections: one was the traditional yard goods display, the other the centre for modern fabrics, created for the modern women of Japan. The discrepancy between the two was staggering. The first one was filled with an endless variety of excellently designed patterns, any one of which I could have bought blindfolded because there wasn't a bad one among them. The second one was filled with the haphazard output which we know so well from our own stores, where quality of design is strictly accidental and often not higher priced than indifferent or bad design. Since in the past the Japanese customer had obviously been exposed to a selection of the very best, it seemed incomprehensible that their modern designers should suddenly be satisfied with turning out such inferior and uneven work. The explanation is, of course, that in former times the vast majority of the buying public knew how to choose from the big reservoir of tried and true patterns which was only so slowly increased that no half-baked work had a chance to get by in the elimination process. It takes discipline, discrimination and an instinct for quality on the side of the customer as well as of the designer to bring about such a high standard of work, and it is this interplay between the creative artist and an understanding public which is missing in our world to-day. The fast change from an evenly high level of design in Japan to the uncertain, groping, perpetually experimental approach of the Western world shows that even such a highly gifted and trained people as the Japanese cannot successfully cope with the pressure of the modern sales campaign which has so completely upset the slow, discerning, knowledgeable ways of the past.

Can we extricate ourselves from this merry-go-round and supply the young generation with the resilience, the independent judgement and the moral stamina which would enable them to rise above the cloud of fake values which is smothering us?

You may say that I am repeating myself when my answer is again: more intensified education. We cannot hope, at this point, to regain lost ground by expecting gradual improvement to come from the slow-moving, natural adjustment of human nature to the impact of events; events have a tendency these days to run us down faster than we can respond to them unless we manage to make education into a force that does not only sharpen and illuminate the mind, but also forms the sensibilities and guides eye and hand as well. This kind of education we had until now reserved for the artist, but, if we cannot give it to everybody, the gulf between him and the people will remain unbridged. If we congratulate ourselves to-day on the strides that have been made in releasing the young artist from the bondage in which he was formerly held by having to follow the methods and recipes of his teacher, we must realize that the greater part of the task is still before us: namely, to give to the average young person, right from the beginning of his schooling, a visual training based on objective principles, i.e., on the laws of nature and the psychology of man. Standing on such a sound foundation, the gifted individual will find his personal interpretation, but artists and public alike must start out from the same premises of universal validity; only then will creativity of the maker find the response of the user.

For me there isn't much more time left to carry on this work, but I hope that England, the most mature country of the Western world, and most conscious of the great power of education, will produce men who will eventually blaze a trail out of the commercial jungle in which we are entangled ; for it seems to be unimaginable that human nature should not eventually rebel against the conspiracy to replace the 'tree of life' with a sales spiral.

Again, Sirs, my deeply felt thanks.

BEQUEST FROM MRS. KATHARINE MALTWOOD

The Secretary has been informed by Mr. John Maltwood, of Victoria, British Columbia, that his late wife Katharine Maltwood, who was elected a Fellow in 1940, has left to the Society the residue of her estate, subject to the life interest of Mr. Maltwood. The sum which it is estimated will come to the Society in due course is about £40,000. The Council has been deeply gratified to learn of this extremely generous bequest—the largest in the Society's history.

Mrs. Maltwood, who died on 29th July last, was a distinguished sculptor whose work was prominently exhibited and much admired in this country and in Canada, where she had lived since 1938. Much of her inspiration was mystical and mythological in origin. She was deeply interested in folklore and devoted many years to the study of the Somerset Zodiac—the immense, prehistoric earth effigies of the constellations lying in a circle between Glastonbury and Somerton—and its connection with the Arthurian legends of the Round Table and the Graal. Of this subject she gave an illuminating account in *A Guide to Glastonbury's Temple of the Stars*.

In 1939 Mr. and Mrs. Maltwood adapted their home on Vancouver Island as an art museum, and endowed it with a collection particularly rich in early Chinese paintings and ceramics, but containing also modern paintings and outstanding sculptures by Mrs. Maltwood herself.

PRESS RECEPTION

On Wednesday 1st November, before the Inaugural Meeting of the Session, representatives of the Press were invited to a Reception at the Society's House to meet the Chairman and Members of Council. A buffet luncheon was served, and the Chairman then gave an informal address in which he spoke of the activities arranged for the new session and emphasized the great importance which the Society attached to the co-operation of the newspaper and specialist press in making its work more widely known.

NEW HONORARY CORRESPONDING MEMBER OF THE SOCIETY

The Council has appointed the following to be an Honorary Corresponding Member of the Society:

Pennsylvania & New Jersey, U.S.A.: John F. Harbeson, M.S., 1510, Architects Building, Philadelphia 3, Pa.

INDUSTRIAL ART BURSARIES EXHIBITION

The exhibition of winning and commended designs submitted in the 1960 Industrial Art Bursaries Competition will be on view at the Midland Design and Building Centre Ltd., Granby Street, Nottingham, from 4th to 30th December.

THE SOCIETY'S CHRISTMAS CARD

There is still time for Fellows to order Christmas Cards, particulars of which are given on the form at the back of this Journal. The printers, however, have a great deal of work on hand, and it is not possible now to accept orders for overprinting the name and address.

This notice is the last opportunity there will be of reminding Fellows about Christmas Cards for this year.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 13th November. Present: Lord Nathan (in the chair); Lord Bossom; the Honble. G. C. H. Chubb; Lord Conesford; Mr. P. A. Le Neve Foster; Mr. E. Maxwell Fry; Mr. John Gloag; Sir Ernest Goodale; Dr. Stanley Gooding; Mr. Milner Gray; Dr. R. W. Holland; Mr. J. C. Jones; Mr. Edgar Lawley; Sir Harry Lindsay; Mr. Sidney Loweth; Mr. F. A. Mercer; Mr. Oswald P. Milne; Sir Ronald Nesbitt-Hawes; Mr. Brian O'Rorke; Sir Gilbert Rennie; Mr. A. R. N. Roberts; Professor S. Tolansky; Mr. G. E. Tonge; Dr. P. F. R. Venables; Mr. Hugh A. Warren; Sir Harold Wernher; Miss Audrey Withers, and Sir Walter Worboys; with Dr. K. W. Luckhurst (Secretary); Mr. G. E. Mercer (Deputy Secretary), and Mr. J. S. Skidmore (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society:

Alagoma, Dagogo, Nigeria.
Amazu, Ikem, Nigeria.
Aryee, Clement Ayikuma, Ghana.
Asquin, Marcel Charles, M.Ed., Calgary, Alberta, Canada.
Bailey, Miss Dorothy Lucy, Ewell, Surrey.
Brear, Gordon, Dip.Arch., Dip.T.P., A.R.I.B.A., Halifax, Yorkshire.
Davis, Basil Montefiore Joseph, M.I.E.E., London.
Dridan, David Clyde, Adelaide, S. Australia.
Ejiogu, Godwin Uregbula Fred, Nigeria.
Fairhurst, Robert Francis, Dip.Arch., A.R.I.B.A., A.M.P.T.I., Gloucester.
Faunt, Archibald, Southport, Lancashire.
Fitzgerald, John Patrick, N.D.D., Folkestone, Kent.
Foden, Francis Edward, B.Sc.(Econ.), M.Ed., Ph.D., Loughborough, Leicestershire.
Gosford, The Right Honble. the Earl of, O.B.E., London.
Hare, Professor Frederick Kenneth, B.Sc., Ph.D., Préville, Quebec, Canada.
Hoad, Alan Peter, Cranleigh, Surrey.
Ivens, Roger John, A.R.I.B.A., Port of Spain, Trinidad, West Indies.
Kidd, Reginald A., C.B.E., B.Sc., M.I.C.E., Nottingham.
King, Professor Jeffrey William Hitchen, M.Sc., M.I.C.E., London.
Lewis, Roger Anthony, Newcastle-upon-Tyne.
Martin, Mrs. Moira, Newcastle-upon-Tyne.
Mercer, John Stewart, L.G.S.M., Belfast.
Miller, Horace Albert, Hoddesdon, Herts.
Morris, Miss Jill Diana, London.
Munro, Ian, Port of Spain, Trinidad, West Indies.
Oduwole, Simeon Adebayo, LL.B., Nigeria.

Purefoy, The Revd. Canon Brian, Tewkesbury, Gloucestershire.
Roberton, Miss Robina Josephine, Westcliff-on-Sea, Essex.
Rolfe, Peter Charles, Northampton.
Sadler, Jacques, Skipton, Yorkshire.
Samuel, The Revd. Paul Gurubadam Thangarag, B.D., Kota Bharu, Kelantan, Malaya.
Sharp, Arthur Granville, M.A., Rickmansworth, Hertfordshire.
Smith, Jack, Sale, Cheshire.
Steckle, Ward Allan, M.Sc., Calgary, Alberta, Canada.
Topping, James, M.Sc., Ph.D., D.I.C., F.Inst.P., Leatherhead, Surrey.
Walters, Derek, Manchester.
Williams, Peter Ernest, N.D.D., A.T.D., Wirral, Cheshire.
Wilson, Sir Reginald Holmes, London.
Wright, Henry Brainard, LL.D., Shreveport, Louisiana, U.S.A.
Wright, Lionel Percy, St. Albans, Hertfordshire.

The following candidate was elected a Benjamin Franklin Fellow of the Society:
Rosenbaum, Samuel Rawlins, B.S., LL.M., Philadelphia, Pennsylvania, U.S.A.

The following was admitted as an Institution in Union with the Society:
Royal Society of British Sculptors, London.

The following Companies were admitted into association with the Society:
Colvilles Ltd., Glasgow.
Tyne Tees Television Ltd., Newcastle-upon-Tyne.

The following Fellows were appointed Benjamin Franklin Fellows of the Society:
Artzybasheff, Boris, Old Lyme, Connecticut, U.S.A.
Fabri, Ralph, B.A., New York, U.S.A.
Perry, Townsend Rathbone, A.B., Boston, Massachusetts, U.S.A.
Rand, Paul, Westport, Connecticut, U.S.A.
Edward Stassen, Harold, LL.D., L.H.D., Philadelphia, Pennsylvania, U.S.A.

NEW HONORARY CORRESPONDING MEMBER

Approval was given to the appointment of a new Honorary Corresponding Member of the Society for Pennsylvania and New Jersey, U.S.A. (see separate Notice on p. 8).

BEQUEST FROM MRS. KATHARINE MALTWOOD

It was reported that Mrs. Katharine Maltwood had bequeathed to the Society the residue of her estate (see separate Notice on p. 8).

BENJAMIN FRANKLIN MEDAL, 1962

A name was agreed upon for submission to the President in respect of the 1962 award of this medal.

EXAMINATIONS

It was reported that 48,041 entries had been received for the autumn series of examinations, an increase of 6,642 over the corresponding figure for 1960.

NATIONAL ADVISORY COUNCIL ON ART EDUCATION

Mr. A. B. Read, R.D.I., was reappointed the Society's representative on the National Advisory Council on Art Education for a further period of three years.

OTHER BUSINESS

A quantity of financial and other business was transacted.

THE SHRINKING WORLD: WHAT NEXT FOR BRITAIN?

The Inaugural Address of the 208th Session by

THE RT. HON. LORD NATHAN, P.C., T.D., F.B.A.,

Chairman of Council of the Society, delivered to the Society on Wednesday, 1st November, 1961

There have been predecessors of mine within relatively recent years who have chosen for their Inaugural Address subjects relating to this Society in various of its aspects. Some canvassed the past history of the Society, placing reliance on the epic work of Dr. Luckhurst, not only Secretary but Historian of the Society; some have attempted a probe into the future. They have covered past and future, the history and the prospects of this Society, in a way which made me think that there was nothing left along those lines for me. I felt therefore that I would select for myself a subject which was quite different, having no immediate relationship to the Society as such, though a close relationship to the times in which we live and to everyone of us here in this Room. The subject I have chosen I define for the purposes of to-day as 'The Shrinking World: What next for Britain?'

Such a subject needs to be approached in the spirit of calmness, objectivity and realism. In that spirit let me come to grips with it.

I begin by suggesting to you that no shock can be more painful for a circus strongman than the dawning realization that he can no longer lift the dumb-bells and weights which have been his livelihood and made him a popular hero. Yet how catastrophic it can be for him if he fails to face the truth at the right time. His health may be ruined; he may even suffer a fatal accident; his chances of a prosperous middle age and calm retirement turn on his ability to adapt himself to a new trade that does not depend on brawn alone. I suppose this is also true of other occupations—opera singers, for instance. Certainly it is true of nations. The skill and realism with which a nation adapts itself from an age of power to one where it must defend its interests by brain and influence can be decisive for its prosperity and security, and perhaps too for the well-being of the world around it.

This is, patently, the central problem for the British in the '50s and '60s, perhaps in the twentieth century as a whole. Certainly none will dispute that a staggering change has occurred in Britain's position in the world. A century ago Palmerston and the Queen's Navy presided over the Pax Britannica. To-day the Navy consists of four aircraft carriers and a handful of destroyers and submarines, in all about a fifth as strong as the American fleet. It is much the same with the other sinews of power. A century ago Britain produced some four million tons of iron, as much as the rest of Europe and America put together. To-day British steel production—some 24 million tons a year—is about a seventh of the combined output of America and Russia.

The transformation is by no means wholly bad. This trading nation has not

lost in well-being through the prosperity of others; despite our present bout of economic difficulties, we enjoy, as a nation, greater prosperity, and perhaps greater social justice than ever before. But though our absolute wealth and power are undiminished, our relative position in the world has plainly declined, as other continents have seized on the industrialism, the nationalism and the ideas of popular government which Europe pioneered in the last century. This small island's power in the world is now more in keeping with its population and geographical extent than it was in the epoch when Britannia ruled the waves.

I do not think we have done badly so far in adapting ourselves to these altered circumstances, apart from the occasional dropped weight and bruised toe. History, after all, offers no parallel to the transformation of Empire into Commonwealth. Of course it would be wrong to succumb to our national vice of complacency about this. India, Ghana, Nigeria—and now the other African states—have not, after all, been given independence purely because we believe in the brotherhood of man. Changing facts of power have helped to teach us where our enlightened interest lies. All the same, the grant of independence to some 650 million people and the formation of a partnership of equals on this scale is something to be proud of. 'To teach men how to be free'—even under occasional duress—is indeed a noble mission. In this the former muscle-man has shrewdly gauged his strength and weakness, and shown wisdom in choosing a new vocation.

Yet there are still fields in which, as a nation, we have not yet fully drawn the consequences of the altered facts of life and where we still waste our precious strength. One is the military field. The world map is still dotted with tiny splashes of crimson—the bases that are the military remnants of our old domain. These splashes of colour are without doubt a political liability. The struggle to retain bases has done more damage to the Commonwealth than the bases themselves have ever done good. When I read about our stretched economy and our strained defences, I am puzzled to know why so much effort is expended to keep them. Aden, the Falkland Islands, Kenya, Singapore, Cyprus, Malta and the rest of them, were invaluable coaling stations in the age of the Pax Britannica, but their twentieth-century function is less apparent. Militarily we no longer have the forces to mount any kind of major operation from them; and since it has long since been our policy to give independence to the territories round about, it is difficult to see what an operation could be for. There are, of course, strategic uses for bases—for bombers, for example. But the impression remains that some British bases are relics, not redoubts.

A second shortcoming goes rather deeper. Though the soldiers may be a little behind the times, we have on the whole shown skill in the retreat from empire. The defensive ability to extricate ourselves from tight corners without too much damage is an old British characteristic. But I am not sure that we have yet shown a comparable ability to take our positive opportunities in the twentieth-century world. If our interests and ideals as a nation are to be defended by influence, not power, we have to look afresh at how we make friends and influence people, at our relations with other nations, at our whole place in the international community.

For if Britain's relative stature has diminished, the world itself has also shrunk,

forcing the nations into far greater dependence on one another, making it impossible for Britain, even in decline, to fall back on itself and become a Little England. It took the *Cutty Sark* eight weeks to get to Australia in 1861. To-day we can do it in a day, and men may be colonizing the planets within our lifetime. Altered communications lie behind changes in defence, economics, and social manners, too. The *mores*, 'pop' music and clothes of our teenagers follow a universal occidental style; the daily incidents of politics are part of a world-wide struggle. As de Tocqueville foresaw, power is now polarized in America and Russia; and their weapons could within a few hours destroy all life in every corner of the globe.

Interdependence, in other words, has become an everyday fact of life. In defence we now depend on our allies for survival—on Nato, on a system of collective security. In an age of nuclear weapons the Channel, effective barrier for a thousand years, means almost nothing; our front-line is the Elbe. Indeed it is almost incredible that a bare twenty years ago Britain was able to stand alone against the world's most powerful military power; it is inconceivable to-day. Throughout modern times Britain has sought to keep some kind of friendly bridgehead in the Low Countries free from domination by a major power. All Western Europe is our Low Countries to-day.

As in defence, so in politics, a new strategy is imposed by the changing facts of power. For four hundred years British policy has been concerned with manipulating the balance of power in Western Europe. Since Western Europe dominated the known world, a policy of preserving an equilibrium on the Continent, so that no single power became predominant, was highly logical. To-day the power that threatens Britain is not any of the puny states of Western Europe but Russia, towering above the rest. Even the old logic of the balance of power dictates to-day, not any attempt to manoeuvre for position within the old European arena, but close political solidarity with Europe, with America, and with the West as a whole.

This is the background, in terms of political strategy, to the various plans of economic integration that are now pushing their way into the limelight: the Common Market, the European Free Trade Association, the ideas for Atlantic unity that one hears aired, the other regional schemes in different parts of the world. All are responses to the shrinking scale of things. In defence we have recently discovered that this country simply cannot afford to make and keep the Supreme Weapon on its own. It has to rely on the Americans or combine with other allies to make it. Much the same is true of the new space industries and of the aircraft industry. These are already finding the framework of the nation painfully constricting. Markets are too small; technological resources are too small; finance is too limited. The close partnerships these industries are developing with America and Europe are a sheer necessity for their survival.

In other industries, too, Adam Smith's old principle that the effectiveness of the division of labour is limited by the size of the market is forcing itself on the attention of industrialists and politicians. Adam Smith made the point, you may remember, that ten men, operating an efficient division of labour, could make 48,000 pins a day. But they could only attain this level of efficiency if the market was large enough to sell the pins. Some of our motor manufacturers would heartily

bear out the argument. The two major firms in the United States each make upwards of two million cars a year; the whole British industry produces little more than a million cars. Here, and in many of our most modern industries, the scale of the nation is becoming obsolete. Even where, as in say chemicals, the market of a single European nation is large enough to contain one optimum firm, it is often too small to contain *more* than one and hence too small for effective competition. Larger markets look like being the precondition—even the driving force—of the next phase of economic growth in the West after the post-war revival.

We have also learnt from the bitter experience of the 1920s and 1930s that problems of economic policy have to be solved collectively. A start was made in the post-war years with O.E.E.C. and the International Monetary Fund. But in this year of sterling crisis and of the Common Market debate I think we can say that we are entering a new phase. In the sterling system, after all, we have yet another characteristic residue of our old system of power; a great and impressive part of the world's economic machinery but one which has been a cruel and debilitating burden on Britain's frail economic biceps. It is good that there is a growing realization that new joint international machinery has to be devised—in the I.M.F. and elsewhere—to do the kind of job the pound and dollar have been doing on their own: financing the world's vastly expanded trade, acting as reserves for many national currencies. As Western nations seek the elixir of economic growth without the constant tears of balance of payments difficulties, a progressive interlocking of their economic policies and reserves seems inexorable.

All this is not a plea for any particular scheme of integration or co-operation, for joining the Common Market, say, or not doing so. My purpose is to try to show that all these schemes—the Common Market, the Atlantic Community, the International Monetary Fund, the Commonwealth—are part of a new pattern in which this nation has to live. We may have considerable difficulties in choosing one or another scheme, in adapting them to our own needs; but whatever the difficulties we shall serve our interests best and fulfil our highest traditions if we play an active part. Britain, after all, has not only a great inheritance of industrial wisdom, but a gift of tolerance, a political poise and stability which the world badly needs. In an age of influence rather than power, it is by playing a full part in the new communities that these qualities can be asserted with most effect.

How stands our Society in all this?

I should like us to make some positive contribution to alerting the Nation to an awareness of our shrinking world and the problems that ensue. Perhaps this Address may be the start.

In the harsh conditions of the times it is well to recall that time and again in the past we have faced change and the risks that come with it, and have met their challenge manfully. To-day you may scan with anxious eye in vain the long annals of our island story to find change so striking and dangers so imminent, by a strange conjunction of circumstance linked together in time. Yet, as in the past, so now, I have the sober confidence that the temper of the British people will master our destiny. Indeed, that we *must* believe—or supinely sink into dimness below the horizon.

I suppose each of us within his own inner being carries some picture of how he would have this Nation comport itself in the face of dangers impending. I will tell you mine. I will tell it to you in the noble and virile words of the mighty Milton.

He was writing of the England of some sixty years after the defeat of the Armada. I speak to you rather more than forty years after the crushing victory of the First War, and nearly twenty after the complete surrender of our enemies in the Second War.

Ebb and flow, ebb and flow; but always in the end at longer remove or shorter comes the flood.

What Milton wrote of England in the ebb after the Armada I adopt to describe Britain in the aftermath of two world wars:

> Methinks I see in my mind a noble and puissant Nation rousing herself like a strong man after sleep and shaking her invincible locks. Methinks I see her as an eagle mewing her mighty youth and kindling her undazzled eyes at the full midday beam.

That is the picture that I hold before my eyes.

Here then is the task.

Let us to our labours.

THE CHAIRMAN *prefaced his Address with a short eulogy of his immediate predecessor, Mr. Oswald P. Milne, expressing appreciation of his great services to the Society during the past two years.*

After his Address, THE CHAIRMAN *proceeded to the customary presentation of the Society's awards. He first presented Silver Medals awarded for outstanding papers read during the past Session to the following:*

For Papers read at Ordinary Meetings

A. Samuels. '*Some Traffic Problems of London*'

W. J. Carron. '*The Function of Labour and the Trade Unions in Industry and Commerce*'

Dr. C. B. Frisby. '*Ergonomics—Fitting the Job to the Worker*'

Professor S. Tolansky. '*Some Folk Lore and History of Diamond*'

J. S. Fulton. '*The Future Pattern of University Education in the United Kingdom*'

For Papers read at Meetings of the Commonwealth Section

Professor L. J. Lewis. '*The British Contribution to Education in Tropical Africa*'
Sir John Macpherson. '*Sovereign Nigeria*'

The next award, of a THOMAS GRAY MEMORIAL TRUST *Silver Medal to* Captain Thomas F. Fields *for obtaining the highest marks in the Ministry of Transport's Extra Master Examination, was accepted from the Chairman by Captain G. Ross.*

The Society's first award for JOURNALISM IN THE COMMONWEALTH, *made to* Mr. Bruce Hutchison *for his outstanding contributions in this field during the last three years, was then delivered to Mr. Alan Harvey of the Canadian Press, standing proxy for Mr. Hutchison.*

Then THE CHAIRMAN *presented a* HOWARD PRIZE *of* £50 *to:*

Dr. K. D. Cochran, *for his essay, 'A Note on the Use of High Expansion and Excess Air in the Petrol Engine: the Design and Performance of an Experimental Motor'*

Finally, THE CHAIRMAN *presented a* FOTHERGILL PRIZE *of* £20 *to:*

Mr. R. E. Sant, *for his essay, 'An Automatic Door Stop'*

The winners of the following awards were unable to be present to receive them:

A THOMAS GRAY MEMORIAL TRUST *Silver Medal for a deed of outstanding professional merit performed at sea by a member of the British Merchant Navy:* Skipper Albert Brown.

THE SIR FRANK WARNER MEMORIAL MEDAL *for the best design submitted in the textiles sections of the* 1960 *Industrial Art Bursaries Competition:* James Morgan.

At the conclusion of these proceedings, MR. OSWALD P. MILNE, F.R.I.B.A., J.P., *a Vice-President of the Society, spoke as follows:*

It is my pleasant duty this afternoon to propose a vote of thanks to the Chairman. It is a long tradition of this Society that at the first meeting of the session the Chairman of Council should preside, should read what is termed an inaugural address—rather an awe-inspiring phrase, I think—and should present certain awards. Lord Nathan has been thought-provoking in the one respect, and gracious in the other. His address was one somewhat unusual in this room, but none the less enthralling.

We are fortunate in having Lord Nathan as our Chairman for the next two years. He is a many-sided man, of very wide experience. And he is a man who, if he takes up a duty, does not do it by halves. So we can look forward, under his guidance, to a useful session. We wish him well, and I would now propose a vote of thanks to him for presiding this afternoon.

The vote of thanks was carried with acclamation. The Chairman then declared the meeting ended, and the Company adjourned to the Library for tea.

VOCATIONAL TRAINING AND INDUSTRIAL REHABILITATION

A Paper by

G. H. CULLEN,

Manager, Ministry of Labour Government Training Centre and Rehabilitation Unit, Perivale, read to the Society on Wednesday, 8th November, 1961, with Sir Harold Emmerson, G.C.B., K.C.V.O., formerly Permanent Secretary, Ministry of Labour, in the Chair

THE CHAIRMAN: Ladies and Gentlemen, it gives me very great pleasure to introduce Mr. Cullen. I see, looking round, that he probably needs no introduction to quite a number of you.

He is the Manager of the Government Training Centre at Perivale, and he has been the manager of other training centres doing the sort of work which he is going to tell us about. He has been in this service for a good many years. I call it a 'service' because it is not only that he is a civil servant, but his work is a social and industrial service, and Mr. Cullen, one might say, is a dedicated man.

I am particularly pleased to be here myself because my first job in the Ministry of Labour in 1919 was in the training department where we were developing the scheme for the training of disabled ex-servicemen. Of course, at that time the idea of disability really meant war-disability. There has been a very big change since then, due largely to the imagination of Mr. Ernest Bevin when Minister of Labour and of Mr. George Tomlinson, his Parliamentary Secretary, who got away from the limitation of the State owing something to the ex-serviceman, and extended recognition of the need to help the disabled to people who were handicapped, whether from accident or other causes, or even from birth.

As I say, Mr. Cullen has devoted many years to this service. He is also a very practical man because he has lived with the job, and I can think of no one better qualified to tell us from the ground floor what this service means to so many who have been through his hands.

The following paper, which was illustrated by a film, was then read.

THE PAPER

Some people, unaware of our Society's full title, might think it rather incongruous to read a paper on Vocational Training and Rehabilitation to the Royal Society of Arts. To these people I should like to quote the words of Cicero: 'All the Arts relating to human life are linked together by a subtle bond.' I know no finer examples of such art than those to be found in Vocational Training, where, however, our masterpieces cannot be signed or dedicated, since they are, in reality, the reshaped lives of fellow human beings, some of whom have fallen on misfortune of one kind or another.

Responsibility

Let me first stress that the Government still considers that the main responsibility for the provision of Vocational Training, in this country, rests on the trade or

industry concerned. This responsibility includes both apprenticeship training for the skilled crafts and training for the semi-skilled processes.

The Government Vocational Training Scheme, administered by the Ministry of Labour, is at the present time primarily concerned with assisting certain classes of people, in need of special help, to fit them for suitable employment.

The scheme is also, however, concerned with helping to overcome shortages of trained labour in industries of importance to national prosperity.

At present about 4,000 people a year enter the Ministry of Labour Vocational Training Centres. The majority of these trainees are disabled persons, whilst most of the remainder are ex-regular service men and women. The full complement is made up of unemployed men and women for whom employment could not be found unless they were trained, or who are not already qualified to undertake skilled work in occupations which offer a reasonable expectation of regular employment.

During 1960, 4,280 people entered training; 3,416 completed their courses; 3,319 were placed in industry in the trade for which they were trained. Approximately two-thirds of this number were disabled people.

There are 15 Government Training Centres situated throughout England, Wales and Scotland, within easy reach of the main industrial areas. In Greater London there are four—at Perivale, Enfield, Kidbrooke and Waddon. They offer courses in a wide variety of trades and skills. The length of a course varies from three months to twelve months, according to the degree of skill necessary.

All applications for training are made through the Ministry of Labour local employment exchanges. The age for acceptance varies; for example, disabled persons are eligible from school-leaving age, whilst able-bodied persons are accepted from the age of 18 years. There is no upper age limit. The yardstick of acceptance is—can we reasonably expect to find work for them in their training trade after the completion of the course? As an example of this, we were quite successful in training a deaf and dumb boy in carpentry, and after many months, he is still working at his training trade. At the other end of the scale, we were successful in training an ex-ballet dancer, a woman over 50 years of age, in shorthand/typing. Since she finished her training she has been working as private secretary to a well-known actress.

The disabled men and women in training are substantially handicapped by a variety of disabilities in relation to their employment prospects. Training aims to give them parity with the able-bodied in the employment field.

If it is necessary for the trainee to leave home to undergo the course, lodgings are found locally.

Allowances

All trainees receive maintenance allowances at rates according to individual circumstances. These rates are higher than Unemployed Insurance Benefits, but below the wages they could expect to receive on taking up employment at the completion of their course. The allowances are paid throughout the training period at the Centre.

In certain trades, after leaving the Training Centre, training is continued at the employer's establishment, the employer paying a gradually increased rate of wage until, at the end of this further training, the full rate is received. In some cases the employer receives a training fee from the Ministry during the period.

Fares

Daily travelling expenses are paid to all disabled trainees and to most able-bodied trainees (where the distance is over two miles from the Centre). No deductions are made from their payments for Income Tax or National Insurance.

Tools

Where it is normal in the trade for which the person is being trained for a craftsman to possess his own tools, a free tool kit is given to the trainee when he takes up employment in that trade.

General Conditions during Training

Government Training Centres are run as nearly as possible on factory lines, especially with regard to hours, discipline and working methods. The courses are intensive, the average length being six months. The classes are small, varying in number between 8 and 16. Each week a few hours are devoted to theoretical instruction, but training is mainly given through practical exercises, which gradually increase in complexity until, towards the end of the course, actual production work is undertaken. Periodical progress tests are given, and trainees are encouraged to sit for recognized proficiency examinations. At the satisfactory completion of his course each trainee is presented with a certificate signed by the head of the Training Centre.

A certain amount of holiday leave with pay is allowed to trainees undergoing courses lasting 6 months or more, with a free travel warrant for those who have been recruited from districts away from the daily travelling area.

History

Government Vocational Training actually began in 1917 when instructional factories were set up to train the disabled servicemen of the 1914-18 war. The world-wide depression of the early '30s caused extensive unemployment. There were large areas in the British Isles where thousands of young men were unemployed, and widespread hardship resulted. The number of Training Centres was increased and unemployed young men were selected and accepted for this opportunity of being taught new trades, for which, in spite of the depression, there was a demand. Many thousands of the young men of the country received a training which enabled them to lead a happy and contented life.

During the crisis preceding the outbreak of the Second World War, the emphasis was switched to the training of men and women for the munition industries, particularly engineering, and at the outbreak of the war all training not of direct value to the war effort was discontinued. Steps were taken to increase the number of Training Centres. From 16 in 1938, a total of 38 was reached by the end of 1941, and by that time double and three-shift working was introduced.

The Training Centre at Leeds, with which I was then concerned, was filled to overflowing, and at one time about 2,000 people were receiving training there. Between August, 1939, and July, 1945, no fewer than 420,000 persons, of whom 150,000 were women, passed through the Government Training Courses.

Meanwhile, in July, 1941, the interim scheme for the training and resettlement of disabled persons was inaugurated. The co-operation between the Ministry and the recognized Residential Training Centres run by voluntary organizations dates from the early days of this scheme which, in turn, was placed on a more permanent footing after the passing of the Disabled Persons (Employment) Act of 1944.

In 1945 the Government Training Centres turned to assisting men and women whose careers had been interrupted by war service, and to training labour for the urgent work of reconstruction. A White Paper was issued by the Government which stated that it was expected that some 200,000 returning service men and women would require training. A number of new Centres were opened especially for building training. So sure were we of our ability to train efficiently, that it was only after 16 weeks of training in the Government Training Workshops that we sent these keen, interested young men on to actual building sites, and many buildings, including large blocks of flats, were completely erected by Government Centre trainees under the expert guidance of their instructors. These buildings compared very favourably with others built in the same area and often in the same street. As a point of interest, there is, in the present House of Commons, a large stone-work window made by the stone mason trainees at Kidbrooke Government Training Centre during the time when I was Manager there.

At the beginning of 1947 some 80 centres were in operation, but towards the end of that year, as a result of cuts in capital expenditure and other unforeseen circumstances, training in the building trade was curtailed and limited to disabled persons. The number of Government Training Centres was reduced to approximately the same number as are in operation to-day.

Present Spread of Training

Government Vocational Training was put on a permanent basis under powers conferred on the Minister by the Employment and Training Act of 1948, in addition to his existing powers under the Disabled Persons (Employment) Act, 1944. These Acts were subsequently extended by the Disabled Persons (Employment) Act, 1958. It is administered through three separate schemes with differing conditions of eligibility and scope:

(1) Disabled Persons Scheme,
(2) Ex-Regular Members of Her Majesty's Forces Scheme,
(3) The General Vocational Training Scheme.

Buildings

Government Training Centres are established in modern factory-type buildings with typical workshop floor layout. Hours, timekeeping and other routines follow industrial practice, and from the outset the trainee finds himself in an industrial atmosphere, so that at the completion of his course he has no difficulty in adjusting himself to actual industrial conditions. However, although we aim to reproduce

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Full of confidence and in full command: a machine operator trainee at work

industrial conditions, we are alive to the inherent dangers in certain trades, especially to the beginner, and the numbers in the classes are therefore limited accordingly. Only eight trainees are allowed in the Woodworking Machinist class. The practical and technical content of the course and the type and complexity of machines is another factor taken into consideration in determining the size of the class. There are, for instance, 12 trainees in a Radio and Television Class, and 16 in a Shorthand/Typing Class.

Instructors

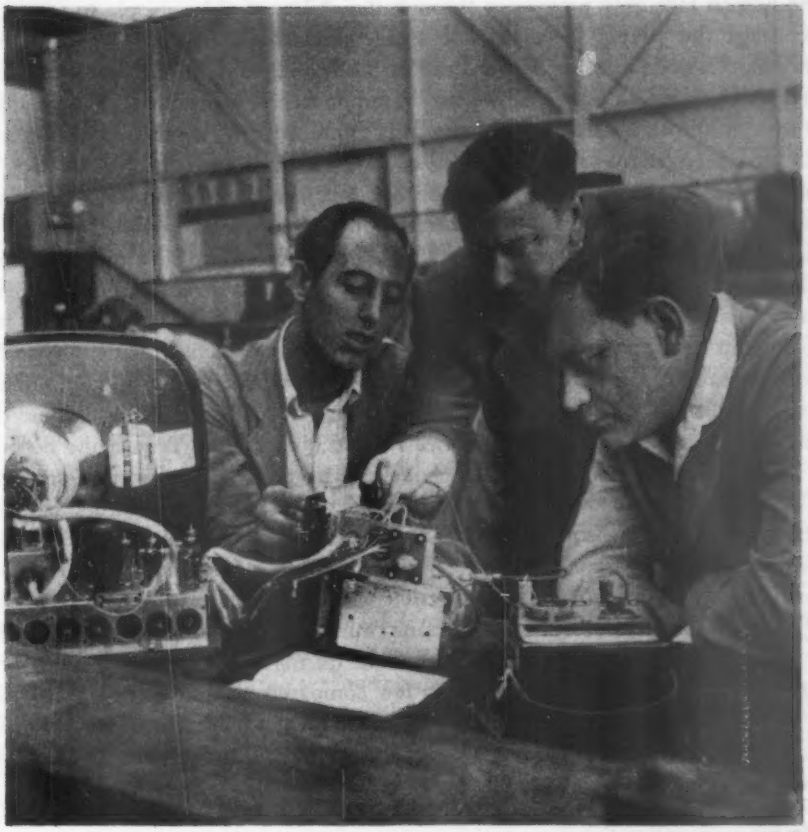
The Instructors in the Centres are selected from workers skilled in their own craft who have considerable industrial experience, have passed the Ministry's trade tests, and have the potential ability to impart their knowledge. They are given a special course of teacher training in the Ministry's own Technical Staff Training College at Letchworth. In my many years as Manager of a Government

Training Centre I have always given much thought to what is possibly the greatest problem in Trade Training—that of obtaining suitable instructors. The first and foremost consideration in imparting knowledge of any worth must be that the Instructor himself should be well practised in his craft, and I have found by experience that only those who have worked for many years at the craft themselves are able to make a success of training. The Instructor should be old enough to have had at least fifteen to twenty years' practical experience, and young enough to be keen and himself ambitious for promotion, so that his own example is in itself an inspiration to his class. I consider that the best Instructors are obtained from craftsmen of between 30 and 40 years of age. Under 30 a man has had insufficient time to gain the varied experience necessary.

The person selected as an Instructor should be able to express himself in terms of simple English. It is very important that information be given in a manner which the student can easily and quickly understand. The English language is such that it is generally unnecessary to use long and difficult words in explanation. The Instructor should have a clear diction, and be able to answer questions without ambiguity. To have a man who has received a full apprenticeship training is of great value, as it shows that he has been keen enough to serve a number of years in order to become a master of his craft. A number of new trades are springing up to meet modern demands, for which, unfortunately, no apprenticeship training has yet been possible. It is quite often necessary to take this fact into consideration.

The Instructor should also possess a wide knowledge of the materials he uses. Much faulty work has been done in the past through the craftsman's lack of knowledge of the properties of the materials he is called upon to use.

I know it may appear strange, but I have personally interviewed hundreds of so-called 'engineers' for the posts of Instructors in Fitting, Machine Operating, etc., and I have been astounded by their complete lack of knowledge of the qualities of the simple materials they have themselves used for years. This could result in a lot of bad workmanship which may easily have been avoided, especially nowadays, when there is hardly any excuse for this lack of specific knowledge. There exist in the British Isles a number of Research Stations from which information can be obtained. Many producers themselves are only too pleased to give full information about the materials they manufacture: for example, the stations for Tin Research, Plastic Research, Paint Research, and so on. I expect my Instructors to know where to look for the most up-to-date information on the materials they are likely to use. I require the potential Instructor to possess a more-than-average degree of patience and understanding. It is not always possible in the time allowed for an interview to ask a great many questions regarding the applicant's actual ability, but the Selecting Officer should take careful note of the way an applicant answers questions. He should keep to the point, not be too verbose, and should keep an even temper. His handwriting and neatness in drawing should be taken into consideration, and this we cover by a written as well as a practical trade test paper. There is a tendency amongst some older people to think they know all the answers. This type would find it difficult to adjust himself to the various training courses that an Instructor has to attend. The person who 'knows it all' seldom makes an efficient Instructor.



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A television repair problem: the instructor advises

Technical education is available even in comparatively small towns in this country, and a potential Instructor should have made some effort to take advantage of the opportunities offered by Technical Colleges and Further Education schemes. At the same time it is true to say that many a highly skilled craftsman has reached his degree of skill without recourse to the Technical Colleges; this fact must also be borne in mind, but the acquisition of a certificate, whether G.C.E., City & Guilds, or, of course, the R.S.A., does indicate that the person is keen in the search for the perfection of his knowledge. The more complete his own knowledge the better he will be able to maintain the interest of his students throughout the length of their course. Many students are very slow starters and are clumsy and ham-fisted, feeling at times that to learn the intricacies of a trade is beyond them, but understanding and careful instruction succeeds in spite of all such obstacles. If the Instructor has the ability to impart knowledge, and is also confident in his own knowledge, then he will pass this confidence on to the student. He must not only make him like his work but must make him feel that he has some purpose in life.

The human race only progresses through the ability of older people to teach and encourage the young. I should like to see emblazoned over the doors of each Training Centre these words from the first Elizabethan age: 'O, what a world of profit and delight, of power, of honour, of omnipotence, is promised to the studious artisan.' Marlowe's words can only be fully appreciated by someone who has seen, as I have seen, the results in renewed confidence, in renewed health—in fact, not only an improvement in his outlook on life, but in his whole mental and physical make-up—that the acquisition of a trade, of the status of a qualified artisan, can make to a man. He may come to us after a disheartening spell of unemployment, sometimes caused through his own fault, often not his fault at all. Family circumstances have necessitated his moving, firms for whom he has been working have 'folded up on him', or he comes with an even more disheartening physical or mental disability; he leaves us a man who is heart-whole, who can, and knows he can, hold his own on equal terms with other men in the battle of life. I could bore you with the number of success stories I could quote. Here is just one of them.

Last Christmas I received a telephone call from the Engineering Department of a large organization. It was from a man who, only a few months before, had been a trainee in our Television and Radio Class. Undoubtedly after a small celebration—for he was full of seasonal cheer—he had been moved to telephone to me and thank the Training Centre for the training that had enabled him to obtain and hold a £700 a year job. However, I must be frank; human nature being what it is, although I have received many letters of gratitude during my life-long experience in Training Centres, they are really very few compared with the enormous number of our successes. But that is perhaps as it should be. These men and women go forth into a new life, indeed, they start life anew, and it is better for them, and I am happier in feeling, that they never look back.

Placing

The continued adjustment of training facilities in the light of changes in the general and local employment situation, and the careful selection of individual trainees with due regard to personal suitability for the trade of their choice and their prospects of subsequent employment in it, are the best possible guarantees of achieving the ultimate aim of placing them in employment in the training trade. Placing action is begun in the Centre Office, by the Placing Officer, some weeks before each trainee is due to complete his course. Employers are encouraged to visit Government Training Centres to earmark likely candidates for vacancies; final training can then be given a bias to suit the employer's particular needs. If a vacancy has not been found by the time the course is finished (in my own experience, this is comparatively rare), placing action is continued by the local Employment Exchange nearest to the trainee's home, under the supervision of the Regional Office that accepted him for training.

The result of these arrangements has been that over 90 per cent of those trained are subsequently employed in their training trade. I should stress that training has always been arranged with the co-operation of both sides of the industries and trades principally concerned.

Syllabuses

The syllabuses of training in regular use are drawn up, and are under constant review, by the Ministry's Technical Officers in consultation with representatives of the trade. In certain trades, industrial representatives also assist the Ministry in the selection of suitable applicants. Most students should possess a reasonably good knowledge of elementary arithmetic and some should be able to make simple calculations by means of the metric system. Arrangements have therefore been made to enable trainees to receive instruction in the practical use of these methods of calculation. We have an Instructor known as the Educational Officer, for this purpose. He is chosen from among the ranks of the craftsmen instructors and must have sufficient understanding to be able to appreciate the limits of this educational instruction, because there is no need to fill the student's mind with calculations that he will never be called upon to make. Much of this academic instruction can be given in such a way as to be unrecognizable as such and thus be made more palatable. For instance, the knowledge of the shapes and properties of various geometrical figures can be given by using these figures as exercises, in, for example, the engineering trade. Thus, the student quickly learns that an equilateral triangle is one which has equal sides, and finds out for himself that it also has equal angles, which are each of 60 degrees. He learns by the practical method to calculate the circumference of a circle by making, for example, a small semicircular exercise, and so on. This kind of practical instruction is more easily memorized and it becomes an interesting way to learn elementary mensuration. It is essential, of course, that the arrangements for this type of instruction should be elastic, and that the Educational Instructor should be able to take the requirements of each trade into consideration, giving practical mathematical teaching accordingly.

It is not necessary to teach a retail bespoke tailor the elements of the metric system, as this trade deals mostly in yards and inches. But it is necessary in most engineering trades to teach, not simply decimals, but also the metric system, as so many calculations to-day are in millimetres. Again, most of the engineering trades require an elementary knowledge of trigonometry, especially where the use of the sine bar is concerned. The building trades trainees need instruction in the solving of right angled triangles in order to set out buildings and in order, for instance, that a carpenter may be able to make full use of the 'steel square'.

Those who are to be trained as shorthand/typists need to have a knowledge of the various weights and measures which are used in business.

The syllabus of training in each course includes a progressive range of exercises, with lectures on the theoretical principles involved, informal talks on the shop floor on day-to-day problems arising during training, and educational instruction related to each trade in basic arithmetic and the reading of drawings. Progressive tests are given during the course and, at the appropriate time, the trainee is moved away from basic training exercises on to selected production work, enabling him to acquire experience of, for example, different materials, cutting tools, jigs and fixtures. This also provides knowledge of job breakdown and production and helps the trainee to learn to meet the production times laid down by industry.

REHABILITATION

May I now pass on to the second part of my paper—that of the Ministry of Labour's Industrial Rehabilitation Scheme. I make no apology for devoting so large a proportion of this paper to Vocational Training, because in many cases Vocational Training is the logical sequence of Industrial Rehabilitation. I am dealing with these two subjects in historical sequence since Vocational Training was initiated before Industrial Rehabilitation. Of their relative importance I would not dare to judge.

The Government has long-since recognized that many workers, after severe injury or illness, have a difficult task to get back again to full production fitness and need help and understanding to bridge the gap between recovery and return to work. To meet this need, the Minister of Labour was given authority under the Disabled Persons (Employment) Acts of 1944 and 1958 to provide courses of Industrial Rehabilitation for all men and women in need of them; and I must at this stage emphasize the word 'industrial'—if only to differentiate between that and Medical Rehabilitation.

These facilities are invaluable to men and women who are finding it an uphill task to get back to work after illness or injury. Most people, in such circumstances, whether completely restored or left with some residual disability, are able, after medical treatment, to go back to their old or to a new job, but some need extra help after they have finished their medical treatment to get them fully fit and confident to return to work. Industrial Rehabilitation Units have been set up to provide courses in the nearest approach that can be contrived to ordinary industrial conditions so that men and women requiring to pass through this additional phase of rehabilitation can become fit for employment similar to that on which they were engaged before they became disabled, or some other kind for which they are now more suited, or for Vocational Training. Industrial Rehabilitation aims at restoring a worker's capacity for employment, at giving him an opportunity to adjust himself to working conditions and to assess his suitability for different types of work.

In the past, sickness and injury have sometimes led to permanent unemployment or diminished efficiency for the individual and, in consequence, loss of man power and productivity for industry. This was largely due to the fact that the process of rehabilitation could not always be carried to the stage of restoring full working fitness, or at least, the maximum fitness that any residual disability would allow. Any man or woman (and this includes young people over the age of 15) who has left school can now get an industrial rehabilitation course if he or she requires it when medical treatment has been completed, or at least, has reached a stage where the main need is to prepare for the resumption of work.

Most of these people pass to Industrial Rehabilitation Courses straight from hospital or their doctor, but there are people who have been unemployed for some time and disabled people who have not been satisfactorily resettled in employment, who can also be admitted to the course; so may persons identified at their place of work, who, for health reasons, are not fully pulling their weight, or who appear

to be on the verge of a breakdown. A rehabilitation course can also sometimes help older workers who are finding difficulty in their present employment and would like to have advice as to their suitability for some different kind of work, and need also help in preparing for it.

Applicants are admitted only when there are reasonable prospects of obtaining suitable employment for them at the conclusion of the course.

The courses are very varied, and a standard curriculum is not imposed. Instead the various facilities are used that best suit each individual. These facilities include workshops, a gymnasium and gardens. The industrial workshops provide rehabilitation on productive work and opportunities for men and women to try their hands at various kinds of work designed to test their aptitudes. Training for a trade is not given during the course, but where an aptitude for a trade is discovered and training is considered necessary it may, of course, be given afterwards in the Vocational Training Centre, or possibly, in a Technical College or at an employer's establishment.

The staff of the Rehabilitation Unit comprises the Unit Manager, who can be and often is also the Manager of the attached Vocational Training Centre, the Rehabilitation Officer, the Medical Officer, the Disablement Resettlement Officer, the Social Worker, the Vocational Officer and the Chief Occupational Supervisor, and seven Occupational Supervisors, each in charge of a workshop. Each member makes an important contribution to the rehabilitation of the people under his care, and the progress of each rehabilitee is carefully reviewed at the weekly Case Conference.

The Disablement Resettlement Officer in each of the employment exchanges in the area served by the Unit works in close liaison with the D.R.O. of the Unit and is responsible for carrying out the recommendations made for the rehabilitees at the end of their course.

The Vocational Psychologist advises on choice of employment, and the Social Worker helps to settle any personal or domestic problems which might hinder resettlement. The course, which is a full-time one, normally lasts about eight weeks, but may, where needed, be extended to twelve. Remedial exercises are carried out under the guidance of a qualified remedial gymnast, and skilled craftsmen supervise the workshop activities.

Conditions of the Course: Personal Allowances

Maintenance allowances are paid to persons living at home on a scale that gives a single adult man £5 10*s* a week and an adult woman £4 15*s*; a married man with two or more dependent children under 16 gets £8 and a woman with dependants gets an appropriate increase. Those who have to live in lodgings during the course receive personal allowances ranging from £3 10*s* a week for a single man to £7 10*s* a week for a married man with two or more children under 16, plus an agreed cost for board and lodging. A midday meal is provided at the Unit for which 10*s* is deducted from the allowances I have mentioned. No deductions are made from any of these allowances for income tax or national insurance.

If the best use is to be made of these two great social services—Vocational

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A Rehabilitation Case Conference team in session: the Rehabilitation Officer (presiding) seeks unanimity if at all possible; the Medical Officer helps with a frank appraisal; the Vocational Officer (a trained Industrial Psychologist) reports on the results of his tests; the Disablement Resettlement Officer explains the employment position; the Social Worker advises on financial and domestic problems, and the Chief Industrial Supervisor gives his opinion on work ability from the factory-floor level

Training and Rehabilitation—the co-operation of the medical profession, of social workers and of employers and industry generally is vitally necessary, both in helping to identify those who can most benefit from the help we can give them and in assisting to obtain employment after they have completed their courses. In the case of the rehabilitees, the ideal arrangement is for the transfer of responsibility from the medical to the industrial service to be arranged before medical treatment quite comes to an end. Close co-operation between each unit and the local hospitals should ensure that those who have benefited from the specialist hospital services will have an opportunity of an Industrial Rehabilitation Course if this is required, or a course at a Training Centre if desirable. The private medical practitioner, too, can help by referring to the Disablement Resettlement Officer at the Employment Exchange, patients who need such help in order to get back into employment.

Within industry itself there is, of course, the Industrial Medical Officer who is also in a position to identify workers in need of industrial rehabilitation.

Resettlement

The only satisfactory end to a course of Industrial Rehabilitation is resettlement in suitable employment, or a Vocational Training Course leading to such employment. The Rehabilitation Units help industry by making disabled persons fit for work and by guiding them into the kind of work for which they are best suited. Industry in turn can help production and the disabled too—by employing those passing out of the Unit.

Employers, doctors, social workers, trade union officials and others interested in this new development, or in the older and longer established Vocational Training Scheme, are cordially invited to come and see for themselves the work that we are doing. An appointment to visit any of the Training Centres or Rehabilitation Units can be made through any Regional or Local Office of the Ministry of Labour.

Numerous representatives of foreign Governments, trade delegations and trade union organizations have visited the Training Centre and the Rehabilitation Unit at Perivale. The many success stories that I can relate to them, the attitude of the trainees and rehabilitees themselves, invariably make a profound impression. This is indeed something in which our country leads the world. One Arab delegate quoted to me the following Turkish proverb: 'Man is tougher than iron, harder than stone, and more delicate than the rose.'

The handling, the re-forming and the re-shaping of this wonderful material is the work of the Training Centres and Rehabilitation Units. It is most exacting and demanding work but the 'end product' is well worth all the effort. The value in terms of human happiness, in the self-esteem and self-respect that a man acquires with the knowledge that makes him a useful and necessary member of Society, is incalculable. Its value to the State is, of course, even greater. It is from the malcontents that the population of our prisons is recruited, and from parents who have lost their own self-esteem that many of our teenage delinquents spring. We have so often been told that we must increase productivity in order to maintain our present standard of living. Only by using all available man-power to its fullest capacity can we do this. It would be a big mistake if we were to concentrate too much on the provision of the higher trade technicians and engineers and not give these same technicians and engineers all the skilled craftsmen we can possibly provide. A highly developed brain is useless if the hands are clumsy, inexpert or unwilling.

We in the Ministry train the hands that have been injured, that perhaps have never been guided, or again, those that have remained too long inactive.

Before concluding and asking you to look at the film on Rehabilitation which is about to be shown, I would like to give to you some concrete examples of our successes:

1. An ex-R.A.F. rear-gunner was trained by us as an instrument maker. He was paralysed in both legs as a result of war wounds, and throughout his training was confined to his wheel-chair. From the very beginning he showed courage and determination and I was extremely pleased to receive a letter from him which said:

> I have settled down and am very satisfied with the job I have obtained. It is very interesting work and my average wage is £13 per week plus overtime.

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> I have settled down and am very satisfied with the job I have obtained. It is very interesting work and my average wage is £13 per week plus overtime.

Before he entered training he was doing very simple, repetitive work for which he had no liking and for which, although he was the fastest worker in the factory, he could only earn £9 per week.

2. Again, a quotation from a letter received from a wood machinist trainee:

Just a line to let you know that all is still all right with me and the boss seems well satisfied with my performance. He lushed me up with a £3 5*s* turkey at Christmas and a 25*s*. rise this week. Thank you for all the patience you have shown whilst I was blundering around your mill and thank you for all the knowledge you knocked into my head and hands.

3. One from a shorthand/typist:

With many, many thanks to Miss Thorne for her splendid tuition; I am very happily settled in my job as Secretary to the Manager of a North Country Insurance firm.

4. From a carpenter:

The reason for my letter is the job the Centre got me has turned out to be just what I wanted. I am happy here, the Manager and the workers could not be better. Thank you for everything.

5. From a coach-body builder:

I sincerely hope the delay in writing to you has not caused any misgivings. I am not very good at expressing my feelings but this does not mean there is no appreciation. I am very grateful for the patience you extended to me. I have bought a house in Hanwell and will be moving very shortly.

6. From a hairdresser:

I have a post at £12 10*s* per week plus 12½ per cent commission and with tips clear £18 5*s*—thanks for the really good training I got.

7. From a watch and clock repairer:

I have received the First Class Certificate from the British Horological Institute, which I am very glad to possess and I owe a lot to you for all the help during my training at the Centre.

APPRENTICESHIP TRAINING SCHEME

A few weeks ago, the B.B.C., in 'Matters of Moment', discussed the training of apprentices. Very little information was given with regard to the Ministry of Labour's effort in this direction. In the spring of 1960 the Ministry introduced a limited scheme of training for apprentices in Government Training Centres, hitherto used exclusively for the vocational training of adults. The intention was to demonstrate the benefits of systematic training and encourage industry, particularly small and medium-sized firms, to expand training facilities in view of the increased number of young persons who would be entering employment in the next few years.

Under this scheme a small number of classes provide first-year apprenticeship training for boys taken on by firms who otherwise would find difficulty in expanding their intake of apprentices or who have not found it practicable to provide full apprenticeship training. The training is provided without charge to the employer, who, however, continues to pay the wages of the apprentice at normal rates. The usual arrangements of 'day release' for further study or education apply during the

year's training, and any employer nominating a boy for a training place at a Government Training Centre is required to give an undertaking to continue the boy's employment as an apprentice afterwards.

At the end of the year 132 apprentices were in training.

We at Perivale have recently begun an Apprenticeship Class in Radio and Electronics and I feel sure that this class will be a great success. The recruitment for this first-year apprenticeship is by way of the Youth Employment Bureaux.

It is hoped that the planned total of 25 classes will be completed before the end of the year. This figure represents 300 apprenticeship places, most of which will be in the engineering trades.

I will conclude with these words of John Ruskin: 'Fine art is that in which the hand, the head and the heart go together'—and, in my estimation, the finest art of all is that of a well-balanced, useful life.

DISCUSSION

MR. G. E. MERCER (Deputy Secretary, Royal Society of Arts): Mr. Chairman, perhaps I might start the discussion by adding a further word to what Mr. Cullen said at the beginning of his paper, to explain why a lecture of this kind is being given before the Royal Society of Arts.

The Society throughout its long history has been greatly interested in technical training. Its full title (to which only the prefix 'Royal' has been added since its foundation in 1754) is 'the [Royal] Society for the Encouragement of Arts, Manufactures and Commerce'; the word 'Arts' in its title thus not only covers the fine arts but comprehends the eighteenth-century synonym for 'skills'. It may not be generally realized, either, that approximately a hundred years ago the Society pioneered the first examinations in vocational skills, and that these technological examinations were the fore-runners of the present City and Guilds examinations, as the Society voluntarily handed them over as a going concern to the City and Guilds Institute when the latter was founded in 1879.

Mr. Cullen's very interesting paper therefore reflects the Society's continuing interest in this important subject and is one of a long series of lectures and papers on technical skills which have been given to the Society in this hall.

THE CHAIRMAN: Thank you. I am sure there are questions to be asked. Perhaps I might start by asking one. You referred, Mr. Cullen, to the interest of the trade unions in the Government Training Centres when men are definitely being trained in a trade. I wondered what was your experience of their interest in the rehabilitation centres and of the employment subsequently, particularly in factories, of men who are still suffering from some form of disability? Have you any experience of any difficulties because of that?

THE LECTURER: We do occasionally have visits from trade unions into the rehabilitation unit, but they come mainly to see the trade training in the vocational training centre.

I do not think at present that they are concerned much about that, but they are deeply interested in the sort of work that we are doing, especially for some of the disabled skilled men from their own trade union, and I can only say that all who have come from my rehabilitation centre have expressed the wish that this sort of thing should be a little more widely known to the members of their own trade union.

MR. WILLIAM CUNLIFFE (Principal, Hethersett Centre for Blind Adolescents): Have you anything to do with blind people?

THE LECTURER: At the moment there are no blind people at my centre.

THE CHAIRMAN: I think we should be quite sure on the question of the blind. I have myself visited one of the training centres at Letchworth where blind people have been in training. In fact, blind people who have been trained and have gone into engineering workshops have proved to be less liable to accident than sighted people, largely because they take more care. They do not take the risks that some sighted people do. I do not know if there is anybody here from the Ministry of Labour who would like to add to that. I can only say what I have seen myself.

MISS NANCY OVEREND (Chest and Heart Association): Mr. Cullen said there was no upper age limit for admission to these centres. I should like to know who decides who should be admitted and what number or proportion of trainees suffer from chest or heart conditions. Such people usually are severely disabled and they are probably older than the majority of the other trainees.

THE LECTURER: Are you referring to vocational training or to both vocational training and rehabilitation?

MISS OVEREND: Both.

THE LECTURER: Eligibility for training is a matter for the local Employment Exchange to decide in conjunction with the Regional Office. The yardstick in both cases is the reasonable expectation of work following either rehabilitation or vocational training.

The second part of the question dealt with numbers. They vary considerably, depending on the trades involved. For example, in my own centre the proportion of people among the typewriter mechanics suffering from chest troubles is something like 50 to 60 per cent, because this is a sitting-down job, and not very heavy. In the watch and clock section, possibly the proportion is again 50 per cent; but in carpentry or in the wood mill, of course, the numbers are negligible. On the whole both for the G.T.C. and I.R.U., about 30 to 35 per cent of the people are suffering from chest trouble. Our main difficulty concerns the bronchitic people. They are very difficult to look after in the winter.

Once again the upper age limit depends on the opportunity for employment after training. It would be very little use for a man of about 50 or 55 to expect to find a job as a carpenter; on the other hand, older men are often accepted for watch and clock repairing. Working in the wood mill is a very heavy job and one would tend to restrict the people there to the under-40s, but not necessarily so—so much depends on the person's outlook on life. I have known many people of 40 who should be retired, and some at 65 who are far more active than those of 35.

MR. J. G. STEWART, C.B., C.B.E. (Ministry of Labour): Mr. Chairman, I should like to add to what you have had to say in answer to the representative from Hethersett. We have at the Letchworth Government Training Centre a special permanent class for training blind people in engineering. Of course, they need certain slight modifications of the tools, and so on, so that they can work by touch instead of by sight, but the class is a very successful one and the people going into engineering, as the Chairman has said, do generally make a great success of it.

MR. L. F. MCKAY: I am connected with the manufacturing industry. I should like to ask Mr. Cullen what is the more usual type of disablement encountered at the centre?

My second comment is that if this work was advertised or made known to industrial concerns, we might possibly help by providing work at the centres to assist with the training schemes for disabled persons.

THE LECTURER: The first part of that question is rather difficult, because we have all types of disability in training, both the traumatic and mental cases, and it would

be extremely difficult for me to itemize them. Shall we say (as I have said before) anybody who would benefit from training and who at the end of the course would stand a reasonable chance of employment.

Do we advertise for the type of work that we require? We do require certain work, because we hope to give an industrial outlook especially to both rehabilitees and trainees. We do not advertise in the sense that we take space in the papers, but we have many visitors coming to the centre, people from employment committees, people from disabled advisory committees, and usually on those committees there are a number of industrial people, and I manage somehow to get important work from them, which helps us considerably. We are not concerned so much with the value of the work as whether the work is valuable to the trainee, and in this case especially to the rehabilitee. We can always do with varied work.

MISS A. FENWICK (National Association for Mental Health): Do you accept for training those who have been at Educational Sub-Normal schools?

THE LECTURER: Educationally sub-normal people can be trained for certain trades if they are not too backward, but of course mentally sub-normal people are not generally suitable. However, we are often surprisingly successful with them in the Rehabilitation Unit.

MISS MARGARET HUNTER (Almoner's Dept., University College Hospital): Mr. Cullen, you said that it was important that cases should come straight from hospital to the Rehabilitation Unit, and as far as we are concerned we should very much like to ensure that this happens. However, how long is the waiting list, as we cannot always keep patients in hospital or give you very much advance notice? This may mean that we miss the most appropriate time for a patient to come to you.

THE LECTURER: At present I have 20 vacancies in my Industrial Rehabilitation Unit which are not filled, and I should be delighted to have them filled immediately. There is not a waiting period of more than two or three weeks. Incidentally, we take care never to *fill* our groups, in case there are cases which must have immediate attention. We always have a place for that type of person.

MISS HUNTER: Do you keep a definite proportion of the different disabilities, and how many can you take of the people who are heavily disabled?

THE LECTURER: We should very much like to have a proportion of traumatic cases to mental cases, but we cannot always achieve that. We should like not more than one third to be mental cases, because the traumatic help the mental cases, and if it were the other way round it could have not such a good effect.

It can be argued that the more types we get the better, because you see how well they begin to mix. You noticed that on the film, how well they mixed, and how much they helped each other.

MR. J. L. GRAY (Ministry of Labour, Training Dept.): I should like to add to that reply. Mr. Cullen would probably agree with me that in some places there is a waiting list, and it builds up for two reasons; partly because a number of the applicants live at a considerable distance and we are limited in the number of lodgings we can find, and partly because we do keep a balance of the disabilities. It is not just a case of reducing the psychiatric cases within a unit, but there is a fairly obvious limit to the number of paraplegics and epileptics that we can take. Generally speaking, two to three weeks is a normal time spent on the application list, but those with one or two rather difficult disabilities may have to wait up to a couple of months.

MR. F. W. MARSH (George Wimpey & Co. Ltd.): Mr. Cullen, I assume that you train men who have not had any experience to become, say, carpenters. How long does it normally take to produce a carpenter, and when you have done it is he accepted by the trade unions?

THE LECTURER: The training of carpenters in Government Training Centres in the London area is reserved for disabled people only; we are not training the able bodied. We give a six months' course, which is the basic course, and this is followed by a further fourteen months with an approved employer, who guarantees at the end of that period that the man will receive the then full rate of pay. It is twenty months in all and by that time he is accepted by the trade union.

MR. J. H. GORDON: On the same basis, what sort of qualifications do your watch and clock people receive when they leave the Centre?

THE LECTURER: The watch and clock training is of twelve months' duration and the trainees all receive a certificate signed by me. Most of them sit for the British Horological Institute's examinations, and I am very pleased to say that the majority receive a first class certificate. There is also the British Watch and Clock Makers' Guild, who are very interested in our training, and again the majority sit for that examination also.

So when they leave us they have got the first class certificate of the British Horological Institute and also the first class certificate of the British Watch and Clock Makers' Guild, both well recognized qualifications.

MISS S. COCHRANE (Almoner, St. Benedict's Hospital, S.W.17): Do you report back to the medical unit about the patients you are training? We would be very pleased to have a report back, but we do not always get one.

THE LECTURER: There is close co-operation between the medical service and our own Medical Officer. He is only too pleased to discuss the cases and report back.

MISS COCHRANE: But you do not do it unless you are asked to do so?

THE LECTURER: We do not usually do it unless we are asked for it. We are interested in getting the patient away from the hospital and back to work as quickly as possible.

THE CHAIRMAN: I am sure you would all agree that we are very privileged to have heard Mr. Cullen. We are very much indebted to him for his very clear and lucid paper, on which I know he has spent a great deal of thought, and for answering the questions.

He did say in the paper that it is a very exacting job that he has, but I feel sure that it must have given him great satisfaction to have done it. I am sure he would also be the first to agree, as I think was said in the film, that he is one of a number of devoted people in the Ministry of Labour, and of course outside the Ministry in various organizations, who are helping in various flexible ways to meet this problem and to help people back to an ordinary working life.

A vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman, the meeting then ended.

NEW DEVELOPMENTS IN THE USE OF SOLAR ENERGY

A paper by

HAROLD HEYWOOD, D.Sc.(Eng.), Ph.D., M.I.Mech.E., M.I.Chem.E.,

Principal, The Woolwich Polytechnic, and a Member of Council of the Association for Applied Solar Energy, U.S.A., read to the Commonwealth Section of the Society on Thursday, 9th November, 1961, with Sir John Woodhead, G.C.I.E., K.C.S.I., Vice-Chairman, Commonwealth Section Committee, in the Chair

THE CHAIRMAN: I first must explain why I am in the Chair. I am here in place of Sir Philip Southwell, who unfortunately has been delayed in the Middle East. He greatly regrets his absence, and I feel myself to be a poor substitute.

The use of solar energy, one of the oldest sources of heat and power, has been the subject of experiments over the ages, but it is only in comparatively recent times that prolonged study has been given to the problems involved. Now there is much activity, and some important advances have been made. From the layman's point of view what, I think, has been lacking is a concise review, not too technical in kind, of the great amount of research which has been done in recent years, and of some of its practical applications. It is this with which Dr. Heywood is concerned this afternoon.

He is extremely well qualified to deal with the subject because he has been studying it, I think, since 1946. He is, as you know, Principal of the Woolwich Polytechnic, and before that was Reader in Engineering at the Imperial College (University of London). In 1955 he went to Arizona to attend the first World Symposium on Applied Solar Energy. In the following year he went to Egypt as UNESCO Technical Adviser on the same subject. Then he visited Malta in 1957 as Adviser to the Government on Solar Energy Utilization. He has also visited the French Solar Research establishment in the Pyrenees, and I think he has put on the table outside the hall some examples of products from the furnaces there. This summer he attended the United Nations Conference on New Sources of Energy in Rome.

The following paper, which was illustrated with lantern slides and models, was then read.

THE PAPER

The energy per head of population used to provide heat, light and power is a measure of the degree of industrialization and standard of living of a country, though this is not necessarily the same as the degree of civilization. Recent publications have shown that energy consumption and national income per annum are closely related; also that energy requirements are increasing at the rate of 10 per cent per annum, so that the supply should be doubled every 10 years. Until recently coal and oil have satisfied the demand, and the modern development of nuclear power ensures that there need be no shortage in the future. Nuclear

power can, however, only benefit those areas that are already intensely developed industrially. Many other countries that are not so favourably placed as regards coal and oil supplies also wish to improve their standard of living, and to do this they must take advantage of the indigenous sources of energy, of which solar radiation may be the most prolific. This does not imply that intermittent solar radiation cannot be effectively utilized in countries such as our own, as coal and electricity prices increase. Indeed, extensive electrification may in itself promote the use of direct solar radiation as an auxiliary means of water heating.

Solar energy utilization involves using the sun's radiation directly, instead of indirectly as a natural concentration either in time as by coal, oil and vegetation, or in space as by wind and water power. Almost any process involving heating or power could be performed by direct solar radiation, given sufficient expenditure of time, manpower and money on research ; the problem is to determine which applications and in which localities such processes could be more economically performed by solar energy than by existing means.

THE SCOPE OF SOLAR ENERGY UTILIZATION

The serious study of solar energy utilization began about a hundred years ago, and some quite elaborate equipment was built during the early years of the twentieth century. This comprised water distilling plant, steam boilers and engines, hot-air engines and even a solar operated refrigerator in 1878.

Most of the inventors during this period of early development used expensive mirror systems to generate steam and hence mechanical power; but fuel was then cheap and plentiful, and although the experiments had some degree of success they were abandoned after a few years. Interest in the subject revived in 1945 and active research was initiated in the United States, but now many other countries are engaged in schemes which have application to their particular localities.

The immediate scope has changed from power development to the collection of solar radiation as low-grade heat, that is, heat at a temperature below the normal boiling point of water. This can be accomplished with relatively simple equipment, and with a collecting efficiency of the order of 60 per cent or greater, whereas there are still many problems to be solved in the generation of solar power, which for inescapable thermodynamic reasons can only have an efficiency of the order 5–10 per cent. This low-grade heat may be used for domestic hot-water supply, house heating, distillation to provide drinking water from salt water and eventually for air conditioning and refrigeration, which would be one of the most beneficial applications in tropical countries.

By using mirror systems to concentrate the radiation, higher working temperatures may be attained, ranging from the simple solar cooker to the elaborate solar furnaces which reach temperatures exceeding 3,000° C. The intermediate temperature range can be used for power generation by means of a heat engine cycle. Solar radiation can be converted directly to electricity by the thermoelectric process or by the comparatively recently developed silicon solar cells, which at present constitute the power source for instruments in artificial satellites.

INTENSITY OF SOLAR RADIATION AND AVAILABILITY

Since solar radiation is the 'raw material' for heat and power, its intensity and distribution is an important matter. The mean radiation intensity external to the earth's atmosphere is 1·98 cal/sq. cm. min., equivalent to 430 Btu/sq. ft. hr. or 1350 watts/sq. m., with a maximum intensity in the green visible light wave length but extending from the ultra-violet to the infra-red wave lengths up to 3 microns. The reduction in intensity at sea-level with clear sky is at least one third, and cloud may reduce the direct radiation to zero. Thus a surface normal to the sun's direction may receive energy at the rate of 1 kw/sq. m. at noon, though less at different altitudes of the sun. The distribution of accurate measuring instruments over the world is insufficient at present, and efforts are being made to provide a closer net-work of instruments so that the availability of solar radiation may be accurately assessed for all countries. Research is also being conducted on the radiation received by surfaces in various positions, so that the optimum may be determined for different seasons and localities. This information is an essential pre-requisite for the proper assessment of applications of solar energy. The figures in the Table are given as a rough guide to the variations that exist between different countries.

TABLE OF COMPARATIVE SOLAR RADIATION INTENSITIES

Country	*Daily average over a year cal/sq. cm.*	*Annual total therms/sq. ft.*
N. Europe	210–240	2·8–3·3
Mediterranean Countries	370–515	5·0–7·0
Sahara	545	7·3
Central Africa	380–540	5·1–7·3
South Africa, Desert	600	8·0
Central High Veld ...	490	6·6
Coastal Regions ...	400	5·4
India and Pakistan	450–540	6·0–7·3
Australia	370–500	5·0–6·8
Japan	280–360	3·7–4·9
U.S.A., Northern States	330	4·4
Southern States	500	6·7
Canada, North	200	2·7
South	305	4·1

Note: These figures are an approximate indication only, as no single figure can be used to represent the radiation for a whole country.

OPERATING PRINCIPLES OF SOLAR RADIATION COLLECTORS

Heat collectors may be divided into two groups; those in which the absorbing surface is fixed in position and which collect the direct and diffuse radiation

without any concentration; and those in which the absorbing surface is combined with a system of mirrors to concentrate the radiation. The latter necessarily rotate to follow the apparent motion of the sun.

Flat-plate Collectors

If a sheet-metal plate is exposed to solar radiation the temperature will rise until the rate at which energy is received is equalled by the rate at which heat is lost from the plate; this temperature is termed the equilibrium temperature. If the back of the plate is protected by heat-insulating material, the exposed surface of the plate is painted dead-black and covered by one or more sheets of glass so that heat losses are reduced, then the equilibrium temperature will be much higher than for the simple exposed plate. Such a plate may be converted into a heat collector by adding a water-circulating system, either by making it hollow or by soldering copper pipes to the surface, and transferring the heated water to a tank for storage. Heat cannot, however, be extracted at the equilibrium temperature since this would reduce the temperature of the system, and therefore the efficiency of heat collection is zero under equilibrium conditions. The other extreme condition is where the flow of water is so rapid that the temperature rise is very slight; then the heat losses are small and the efficiency of heat collection approaches 100 per cent, but with such a restricted temperature rise the system has no practical utility. The optimum conditions are approximately midway between the atmospheric and maximum equilibrium temperatures, whereby an output at a useful temperature is obtained and the efficiency of radiation conversion is about 60 per cent.

The characteristics of a flat-plate collector are shown by the curves in Figure 1, in which the rate of heat collection is plotted against the temperature difference between collector and atmosphere. These curves also show the influence of the number of glass plates on the equilibrium temperature attainable, and that the optimum number of plates varies with the excess temperature of the circulating fluid.

Selective Radiation Coatings

The effectiveness of solar absorbers depends upon a reduction of the heat loss, most of which is due to re-radiation from the exposed surface. The wave length of this re-radiated energy is a function of the absorber temperature and at 100° C. is about 10 microns compared with an average wave length of 0·5 micron for the solar radiation. In these circumstances, a sheet of glass is a satisfactory method of preventing heat loss since it allows 90 per cent of the incoming radiation to pass, but is opaque to the very long wave length re-radiation. At higher collector temperatures, the respective wave lengths overlap and the glass plate ceases to be effective.

Much attention has been given during the last few years to the reduction of this re-radiation by the application of a thin coating of metallic oxide to the collecting surface, which has a selective action according to the wave length of the radiation. A dead black surface has a coefficient of absorption of approximately 95 per cent but a coefficient of emission of about the same value. A coating of metallic oxide

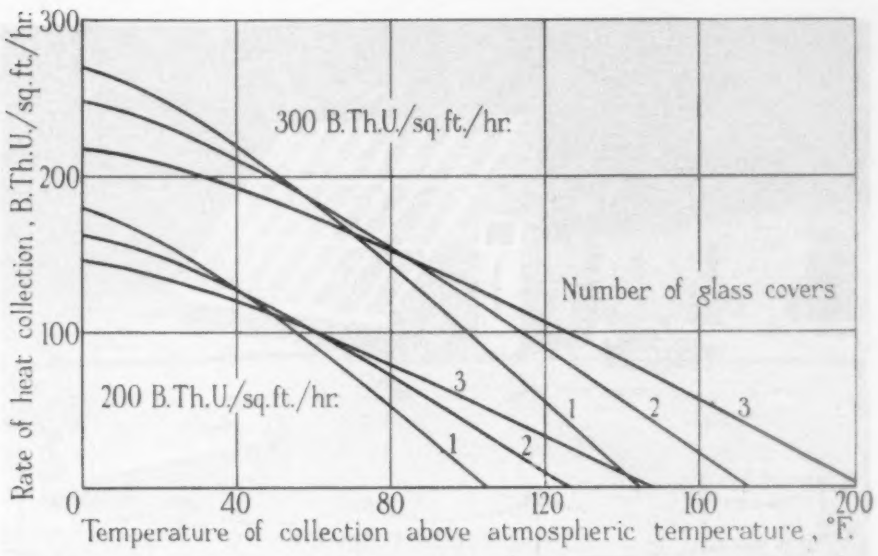

FIGURE 1. *Characteristics of flat-plate type water heaters (see Reference 7)*

of suitable thickness may, however, be transparent to long waves, but still be a good absorber for short waves. Hence if the original surface is polished, then the coating acts as an absorber with a coefficient of about 90 per cent, but as it is transparent to the long waves, the coefficient of emission for the plate corresponds to that of a polished surface, namely, about 15 per cent. These surface coatings can be produced in small areas, but are still difficult to apply on an industrial scale, though they have been shown to improve considerably the efficiency of heat collectors. An alternative method of reducing heat loss from the collector surface is to construct this of polished metal folded into deep Vee-grooves of less than 30 degrees angle. The incident radiation is eventually absorbed by repeated reflections from the bright surface, but the re-radiation loss is reduced because of the low emissivity of the surface.

Mirror Systems

The equilibrium temperature of the flat-plate collector is limited because the area from which losses occur is equal to the area receiving radiation. If, however, a mirror system of relatively large area is used to concentrate the solar radiation upon a heat-absorbing surface of smaller area, then the losses are proportionately reduced and the equilibrium temperature raised accordingly. Whereas the flat-plate collector is in general restricted to a temperature below the normal boiling point of water, mirrors of sufficient size can produce temperatures of about 3,000° C., for which a concentration in energy of 20,000 times is required. Smaller concentrations than this, say 10–100, are sufficient to raise steam at pressures above atmospheric, and quite simple mirror systems may be used for solar cookers.

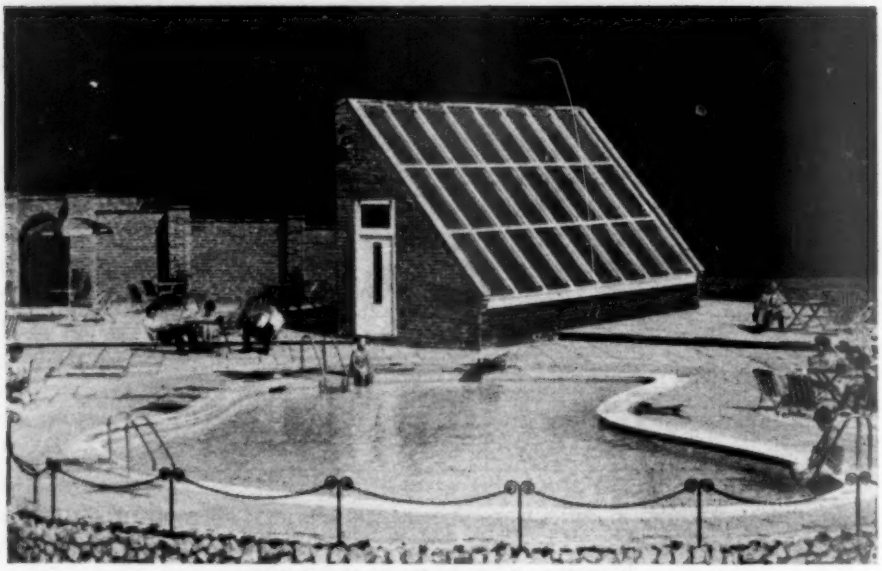

FIGURE 2. *Flat-plate type water heater at a swimming pool in Surrey (see Reference 9)*

Mirrors are generally in the form of paraboloids or parabolic cylinders. The highest optical quality is obtained by silvered glass mirrors suitably curved, but for relatively low concentrations thin plastic with an aluminized surface may often be used.

APPLICATIONS OF SOLAR ENERGY

Domestic Water Heating

This is a relatively simple application, as most of the technical difficulties have been solved, and the problem is mainly one of economics.

There are many constructional designs of solar water heaters, but all consist essentially of a system of water channels combined with areas of flat-plate. The absorber is contained in a box with heat insulating material at the back and one or two layers of glass or plastic covering the front surface. Recent developments have aimed at reducing the cost by the use of plastics and special rolled sections for the water channels, but effective heaters can be constructed from corrugated galvanized iron sheets backed by a flat sheet of metal and connected at the ends to headers. The cost should be less than 20*s* a square foot, and a figure of 15*s* was quoted at the United Nations Conference, 1961, as now being attainable.

Flat-plate heat collectors of the type described above are usually mounted on a roof in a fixed position, preferably facing south, and connected to a water storage tank by flow and return pipes so that a natural circulation is produced by the heating effect. A forced circulation by means of a pump and with thermostatic control may be preferable for some applications, especially if the solar heating is intended

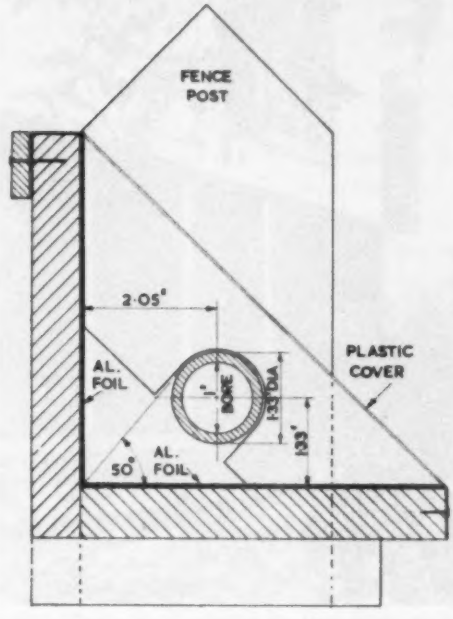

FIGURE 3. *Tube and reflector type of water heater (Carter) (see Reference 10)*

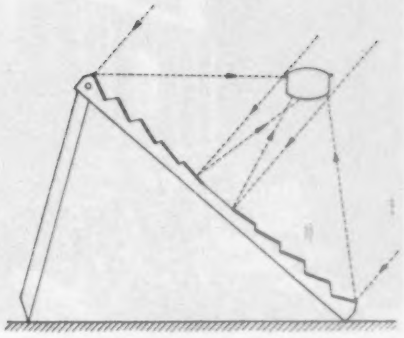

FIGURE 6. *Fresnel-type mirror for solar cooker (U.N. Conf., 1961)*

to pre-heat the water in conjunction with conventional forms of heating. In semi-tropical countries and in the Mediterranean area solar water heaters could be self-sufficient during the summer, and quite effective for some of the winter months. The simple thermo-syphon circuit would be used, the storage tank having a capacity of about 1 gallon for each square foot of collector surface, and water temperatures of 140° F. to 160° F. would easily be attainable. It has been stated that there are over 10,000 solar water heaters in use in Israel, some of quite large size for hospital purposes, and about 350,000 units in use in Japan. The Tropical Products Institute, London, is at present investigating the possibilities of solar water heating in Malta, on which subject the writer made a report in 1957.[8]

Water heating for open-air swimming pools has favourable prospects of success in temperate climates, since only a small temperature rise is needed. Several such installations have been constructed in this country and Figure 2 shows a collector of the flat-plate type which has a surface area of 500 sq. ft. with pumped circulation of the water. An alternative design by the Honble. Mrs. Hugh Carter in the form of a tube or pipe with reflecting surfaces at the back and underneath, is shown by the drawing in Figure 3. The mirrors provide an energy concentration of 3 to 4 times by reflection, and the water is circulated through the piping by means of a pump.

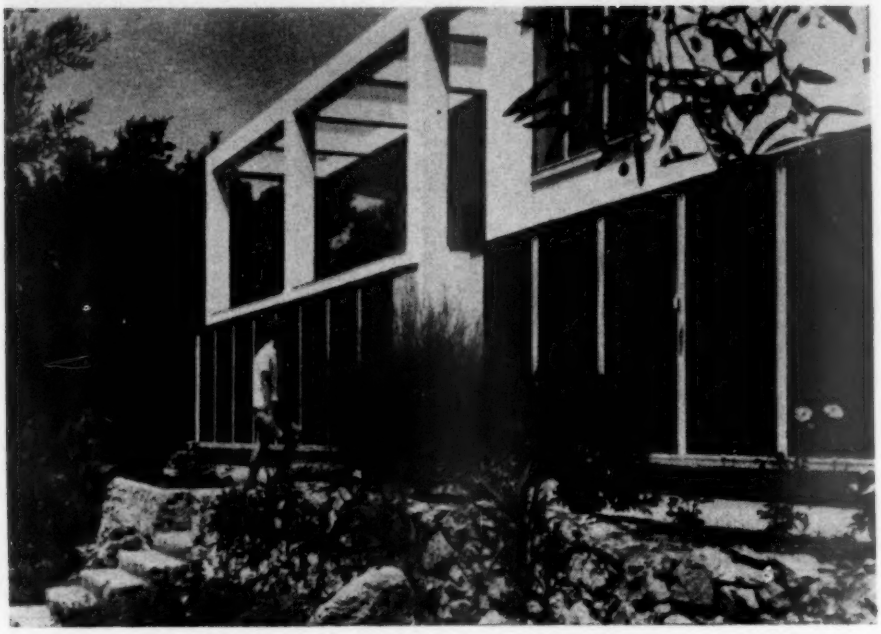

FIGURE 4. *Solar heated house at Capri, Swedish Astrophysical Station (Pleijel) (see Reference 11)*

The same type of heat collector as used for domestic water may be used for house-heating in localities where the winter sunshine hours are sufficient. Such an application would be difficult in Northern Europe, but solar houses have been constructed in the U.S.A. and other countries. Most of the designs differ from the conventional type of house architecture, but a particularly interesting installation in Capri is shown in Figure 4. The possibility of collecting heat during the summer and storing this in the ground for recovery during the winter is being investigated by Mr. A. W. Capps and Mr. Martin Capps. Presently existing storage schemes with a water reservoir are limited to a period of about a week.

It is interesting to consider the economics of solar water heating in temperate climates, for although there are difficulties to overcome, investigations in progress may show that water heating by this means may in certain circumstances become economic in the future. An extension of the use of electrical heating systems would promote the use of solar energy pre-heaters, for the primary rôle of the solar heater should be to perform the initial stage of heating the water from the cold. In this way, it might be possible to halve the cost of the electrical power required.

The economic factors involved are the amount of solar radiation received and the proportion that can be collected as heat, the value of this heat in terms of electricity or fuel, and the cost of the collector. Data from Kew Observatory show that the

equivalent of three therms per sq. ft. is received as radiation during a year, of which some two therms per sq. ft. could be collected as heat. Electricity at a penny a unit is equivalent to 2*s* 6*d* per therm, so that the annual heat value of a square foot of roof in terms of electricity is 5*s*. If the cost of the collector was 20*s* a square foot the purchase price would be recovered in four years. The saving in electricity cost would amount to £10 a year on a 40-sq. ft. heater for the remainder of the life of the heater, which should be at least 10 years.

The curves shown in Figure 1 indicate that the efficiency of collection can be improved by operating at lower water temperatures, and experiments have shown that in this way heat recoveries of 1,000 to 1,500 Btu/sq. ft. a day can often be obtained during the summer, and that an appreciable recovery is possible on many winter days. These experiments lead to the conclusion that the most effective method of utilization is by pumping water through the heater, preferably with automatic control so that the flow is stopped during cloudy periods. The warmed water would be fed to an electrical heater which would supply the extra energy, if needed, to bring the water to a temperature of 130° to 140° F. Research is in progress at Woolwich Polytechnic to provide further data and enable the most economical design of equipment to be determined.

Solar Stills

Solar-operated water stills for the production of drinking water from brackish water could be of benefit in arid areas such as exist in many parts of the Middle East or in Australia. The design must be cheap to construct and without the need for skilled attention, advantages which are possessed by the roof type of still. In this design the saline water is contained in a flat shallow tray, which is covered by a roof-type arrangement of sloping glass plates. The lower ends of the glass plates lead to troughs placed on each side of the saline water tray. Solar radiation evaporates some of the water in the tray and the vapour condenses on the inside surface of the glass plates, so that the distilled water runs down the sloping glass and is collected in the side troughs. The output is about 0·8 lb. of distilled water per square foot of water tray area, and corresponds to a collection efficiency of about 30 per cent. More complex designs could attain higher efficiencies, but if the capital cost increased at the same rate as the output, no benefit would be obtained. The size of these stills has been limited to about 5 ft. by 50 ft. long, but a recent development embodies a cover consisting of an inflated plastic sheet which simplifies the construction of large area stills as shown by Figure 5. A plastic-covered still and a deep basin glass-covered still, each with a surface area of 2,500 sq. ft., have recently been constructed by the Department of the Interior, U.S.A., and are being tested as part of the Saline Water Conversion programme. The results should enable important decisions to be made regarding the future development of solar distillation on a large scale, up to a capacity of 100,000 gallons per day. Other experiments are in progress with multiple effect evaporation, i.e., in stages so that the latent heat released by condensation of the higher pressure steam is used to evaporate water at a lower pressure, and also on the use of a combined air and water circulation system.

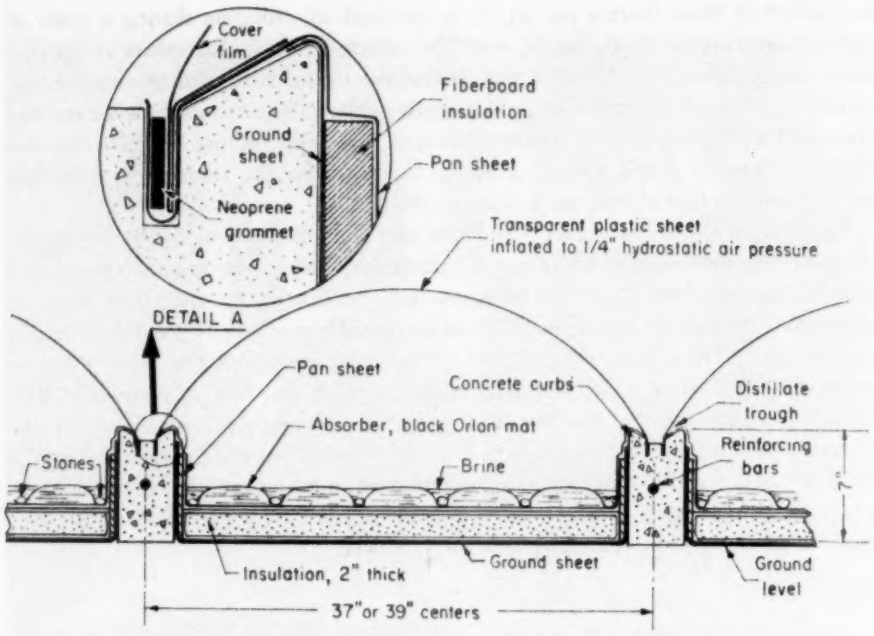

FIGURE 5. *Plastic-covered solar still (Strobel, U.S. Dept. of Interior) (see Reference 12)*

Solar Cookers and Ovens

Concave mirrors of relatively simple construction can be used for solar cooking; precise optical quality is not required and the rays from a 3-ft. diameter mirror should be concentrated to a 3-in. diameter area. The first designs by the National Physical Laboratory of India used a concave mirror spun from sheet aluminium, and had a heat output equivalent to 3,000 watts. Later investigators have reduced the cost of construction by using aluminium coated plastics for the mirror, and a team at the University of Wisconsin is engaged in research on this subject. A very simple design shown at the United Nations Conference 1961 which could be constructed by any handicraft worker consisted of a Fresnel type mirror mounted on a board as shown in Figure 6 (p. 41). One of the main purposes of developing solar cookers for use amongst primitive peoples is to restrict the custom of burning animal dung which should be used as a fertilizer.

Solar ovens consist essentially of a thermally insulated chamber with a glass front cover into which the solar radiation is directed by external flat mirrors attached to the sides of the oven. Temperatures of about 350° F. can be attained, sufficient for baking bread or roasting meat.

Mechanical Power and Electricity

The main purpose of these applications is for generators of 1 to 5 kW for water pumping, saw mills, radio operation and electric lighting on a small scale. One

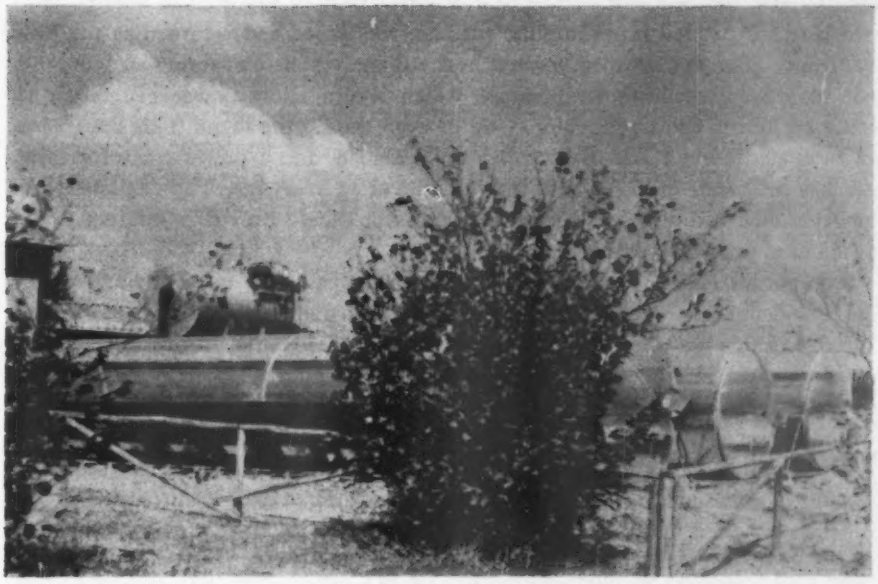

FIGURE 7. *Inflated plastic mirror and power plant (National Physical Laboratory, Israel) (see Reference 13)*

of the normal heat engine cycles may be used to drive an engine or turbine coupled to a dynamo, or electricity may be generated directly by thermocouples or by photo-electric cells.

Since the efficiency of a heat engine cycle increases with the temperature of operation, mirror systems are essential to provide concentration of solar radiation. A famous pioneer installation was the Shuman Boys Solar Power Plant erected in Egypt in 1913, which had a collecting surface totalling 14,000 sq. ft. The cylindrical parabolic mirrors provided steam for a pumping engine, but the plant was abandoned owing to the 1914 war. It is now considered that steam is unsatisfactory as a working fluid because of its relatively large specific volume at pressures below atmospheric, and that organic fluids of lower boiling point than water are better because of the smaller volumes involved.

An interesting solar power plant designed by the National Physical Laboratory of Israel was exhibited at the United Nations Conference in Rome, 1961, and is shown in Figure 7. The heat collectors consisted of plastic cylinders 2 m. diameter by 12 m. long, maintained in a rigid shape by internal air pressure from a fan. The lower half of the cylinders had a reflecting surface of a deposited aluminium. The cylinders were aligned in the E–W position, so that no movement was necessary during the day to maintain the focus on the boiler tubes, and the seasonal change of the sun's position was allowed for by rolling the cylinder slightly every few days. The boiler tubes at the focus were of such a size and shape that 15 degrees toleration in solar direction was allowable. Water was evaporated in the boiler tubes at about

150° C. and the heat transferred in a storage vessel to vaporize an organic fluid which was expanded in an impulse turbine, condensed and returned to the heat exchanger. The system incorporated heat storage vessels containing an inorganic salt of suitable melting temperature which would allow power generation to continue during short periods of cloud or even during the night. This design has an estimated cost of U.S. $1,000 per kW installed, and a power cost of 5 cents per kW hr. based on 6 per cent interest rate at 15 years life. The demonstration model shown had only just been completed, but should provide a solution to the problem of providing power in arid areas.

The hot-air engine cycle has possible applications in the form of small power units, and was first operated by concentrated solar radiation in 1872 by Ericsson. Interest in this has revived recently and the Batelle Memorial Institute, U.S.A., is developing an improved construction of hot-air engine which may be used for such purposes.

The direct conversion of solar radiation to electricity has obvious advantages. Early attempts to accomplish this were by means of thermo-couples; these are junctions of dissimilar metals or alloys which produce an electric current when one junction is heated and the other cooled. As heat is an intermediate form of energy in the conversion, the process is subject to Carnot's law as regards efficiency, so that the heated junction should be raised to a high temperature in order to obtain a satisfactory efficiency. The ideal alloys for the thermo-elements should possess properties which are normally conflicting, namely, a good conductivity for electricity and a poor conductivity for heat, combined with a high thermo-electric power. Recent developments in semi-conductors have produced materials that may partially fulfil these conditions and will make thermo-electric generation a possibility.

The barrier-layer photo-voltaic cell converts the photons of light radiation directly by means of a flow of electrons in a layer of semi-conductor. The familiar photocell used for many purposes has a thin layer of selenium as the light-sensitive material, but the efficiency of this type of cell in direct sunlight is 0·6 per cent. In 1954, Pearson, Chapin and Fuller, of the Bell Telephone Laboratories, developed an improved photo-voltaic cell with a silicon layer which converted solar radiation to electricity with an efficiency of 11 per cent. Electron flow is induced when light falls upon the cell which produces 0·6 volt on open circuit when illuminated by direct sunlight. The present cost limits the use to portable radio equipment and as a power source for artificial satellites, but it is also proposed to use solar cells as a power source for automatic lighthouses and lightbuoys.

This high cost is largely due to the necessity of cutting the cells from single crystals of silicon. Investigations at present being carried out are on the possibilities of using polycrystalline deposits of silicon, or a layer of minute spheres of silicon, though the conversion efficiency will be reduced by these modifications. Alternatively, the problem may be solved by the use of other materials such as cadmium sulphide or gallium arsenide which can be used at a higher temperature than silicon. The extensive funds available for research on space travel and artificial satellite powering will undoubtedly result in the development of methods for the

direct generation of electricity from solar radiation which can be adapted for terrestial use.

Refrigeration and Air-conditioning

These fields could be the most important applications of solar energy in tropical countries, but considerable research is still needed. The present ammonia absorption systems require a temperature greater than is attained by the flat-plate collector, and though they could be operated by means of a mirror concentrating system, this would complicate the equipment. It is possible that the ammonia process may be redesigned for the lower temperatures or that other working fluids may be discovered. Research by J. C. V. Chinnappa commenced at Woolwich Polytechnic and continued at the University of Ceylon may enable a low temperature ammonia cycle to be operated by a flat-plate collector.

Air conditioning may be provided by a lithium bromide water vapour cycle or even more simply by an air humidifying process. In humid tropical atmospheres the air is dried by contact with silica gel, and then saturated by passing over water surfaces, which results in a cooling by evaporation. The silica gel is regenerated in a solar dryer. It has been proposed that houses in the Sahara could be made comfortable by passing the outside air, which is nearly dry, over water surfaces and cooling as described above. The air circulation could be promoted by a solar chimney.

Solar Furnaces

Sir Henry Bessemer constructed a solar furnace in 1868 with which he was able to melt copper and volatilize zinc, but he abandoned this for more profitable research. Modern solar furnaces, though mainly used at present for research on materials at high temperatures, may eventually be found suitable for certain manufacturing processes.

The most impressive solar furnace at present is at Montlouis in the French Pyrenees. A flat heliostat mirror is automatically controlled to move and direct the solar radiation along the axis of a fixed concave mirror, 35 ft. in diameter, which is built up from 3,500 separate mirrors individually curved to the correct focus. The image of the sun, about 3 in. in diameter, is projected into a rotating furnace in which high-grade refractories can be sintered or pure metals melted at temperatures up to 3,000° C.

The individual mirrors consist of segments of flat sheet mirror glass, but each segment must be given the curvature necessary to form a focused image at the furnace opening. This is accomplished by straining each mirror by means of a spider frame with a rod passing through the centre of the mirror and a screwed nut for stressing the rod. In addition to the existing furnace, the Director, M. Trombe, has installed four smaller solar furnaces with 6-ft. mirrors very similar to that designed by Bessemer. These furnaces are available to research workers needing high temperatures for their experiments.

Solar furnaces have been used for the study of reactions at high temperature, such as phase changes in refractory materials, purification of metals, influence of various gases on solids at high temperatures, and gaseous reactions at high

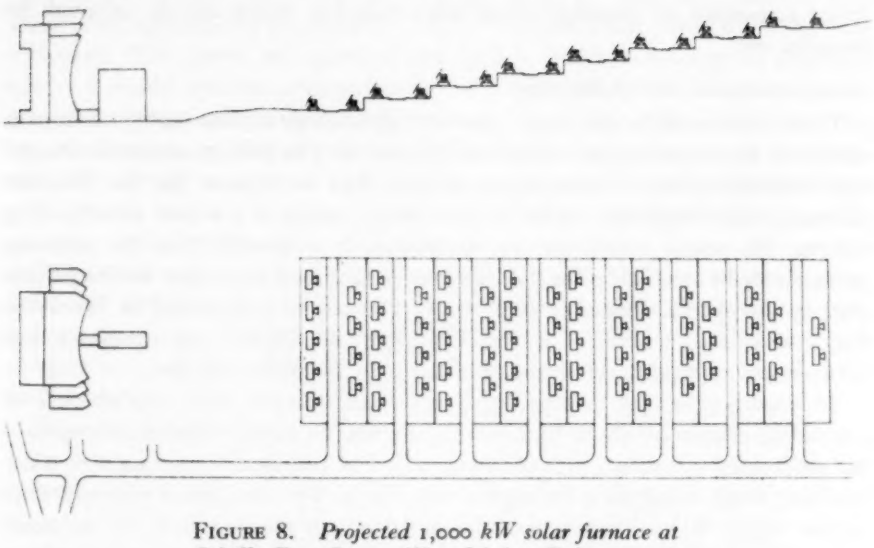

FIGURE 8. *Projected 1,000 kW solar furnace at Odeillo-Font Romeu (Trombe) (see Reference 14)*

temperature, particularly as influenced by ultra-violet radiation. These studies have involved research on the distribution of energy at the focus of the reflector, the optics of mirror systems, automatic control of the heliostat, methods of measuring temperatures and heat flux, so that a large volume of detailed information on the operation of solar furnaces is now in existence. Still larger furnaces are being designed or under construction, and Figure 8 shows the scheme for a 1,000 kW furnace under construction at Odeillo-Font Romeu, near Montlouis. This will consist of 62 flat mirror heliostats erected on a series of terraces on the side of a valley, which will reflect the radiation on to a vertical fixed paraboloid mirror on the opposite side of the valley. The total area of the heliostat will be 2,000 sq. m. and the focal length of the paraboloid mirror 18 m.

CONCLUSIONS

The above sections have given an account of the basic principles and scope of solar energy utilization and of the applications as described at the First World Symposium on Solar Energy held in Arizona, 1956, at the Conference in Montlouis organized by the Centre National de la Recherche Scientifique, Paris, in 1958, and most recently, the United Nations Conference on New Sources of Energy in Rome, 1961.

Many improvements have been made in the design of individual items of equipment for utilizing solar energy during the periods between these conferences. In spite, however, of these and many other activities, there still seems to be some hesitancy by industrial manufacturers to follow up the experimental studies with large-scale production. It is encouraging, however, to realize that there are many people of high academic standing, often attached to universities in various

countries, who are willing to devote a considerable proportion of their time to solar energy applications.

One of the proposals given prominence at the Rome Conference was that a series of experimental stations should be established in various countries where the scaling up from the experimental models to the larger industrial installations could be developed, and in this connection mention should be made of the Brace Experimental Station at Barbados, West Indies, recently established by the McGill University. Much of the discussion at the United Nations Conference concerned the under-developed nations, which might be described more politely as non-industrial, and how these could be helped by the industrial nations. One possible procedure would be for the industrial countries to manufacture and sell equipment to the non-industrial countries, but individuals could not afford to purchase such equipment without a national subsidy in the first instance. The preferred alternative would be for the industrial countries to develop very simple designs of equipment which could be made in the country where required and thereby establish village industries. The first stage might well be along communal lines in villages, for baths, refrigeration and electricity generation, rather than attempting to accomplish these for individual dwellings. The importance of simplicity was emphasized, since in solar appliances the capital cost per unit of energy collected is more significant than the thermal efficiency of conversion.

Finally, it can be stated that for each application in any country there are three consecutive stages of development, namely:

(i) solution of the technological problems involved irrespective of cost;

(ii) development of equipment so that the application is an economic improvement on existing methods, having regard to such factors as density of population, distance for energy transmission, standard of living and conditions of employment;

(iii) overcoming the sociological problem of resistance to change in the traditional style of living and ways of accomplishing various processes.

These objectives will surely provide opportunity enough for those who have faith in the possibilities of solar energy utilization, even if some of these are not yet proved, and who wish to promote the attainment of a deeper knowledge of the underlying principles of this source of energy in order to raise the existing standard of living in the under-developed countries.

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DISCUSSION

MR. EDWARD J. W. CURTIS: For many years I have been interested in problems of solar energy in architecture, and I have recently completed a modern house in

Nottinghamshire which incorporates a solar water heater. I mention this because though the speaker did say that quite a lot of work had been done on problems of hot water supply, he did not describe the Solar House erected in Arizona recently as the result of an architectural competition.

This house is not only heated by solar energy; the link up is with the heat pump and the swimming pool. Dr. Heywood might like to say a word about it now.

I think we have to incorporate solar energy in architecture much more than we have done. The problem is heat storage, as Dr. Heywood mentioned. I believe it is true that if we could store the heat of nine summer days of full sunshine, we would have enough heat for the ordinary domestic house all the winter. Are there any developments in that field likely to impinge on architecture in the future?

THE LECTURER: It is very interesting to hear what Mr. Curtis has said, as we personally know Mr. and Mrs. Bliss. I did not describe the house designed by them because it would be impossible to show slides of all the solar houses that have been designed, and this particular one had to be omitted. It is a very interesting house, however, and they have done good work in developing this. Of course their conditions are ideal, with almost continuous sunshine for the greater portion of the year, whereas the conditions here are very dissimilar, and we have to think on entirely different lines. There are other houses, of course, in Australia and in the Sahara as well as in America.

I cannot agree that nine normal sunny days would give us enough heat for the winter. In fact I really doubt whether the whole of the summer heat would be sufficient for the winter when the inevitable losses are considered, but there is a possibility that summer heat, if stored, would certainly be useful in the winter, even if it were not self-sufficient. Storage of heat in the ground or in large water tanks could be accomplished. Ground storage means high leakage losses but less capital cost in construction than water storage, which would be more efficient but also more expensive. We must leave the problem at that until we have made further investigations, but I am very interested to hear what Mr. Curtis has had to say about his house and to hear about the water heating system, which I certainly think is feasible.

MR. W. R. COX, M.I.H.V.E.: This subject has always fascinated me, but it seems to be impracticable in this country. It would be practicable if we could solve the storage problem. In fact there is a case for studying the application of chemical changes, which, I believe, are used in heat transfer for solar systems, though I am not familiar with the details of them. But it always seems to me that the answer may lie in being able to step up the large sources of direct radiation into concentrated energy through chemical change. I remember reading some years ago of an American house where someone had gone to the trouble of filling a very large cave with large lumps of rock, and had put in quite an elaborate system of ventilation whereby the warm air was driven into the cave and warmed the rocks, and the heat from the rocks was used by reversing the air stream and warming the house with warm air.

THE LECTURER: What Mr. Cox has said is quite true, but rock storage involves the construction of a large capacity cave or chamber. The changes of state mentioned are most important, but one should distinguish between a physical change of state and a chemical one. Quite good storage can be obtained by physical change of state, such as the melting and re-solidification of a crystalline material like sodium-sulphate, which was used in one of the earlier houses built by Dr. Maria Telkes in the U.S.A., and with such a system the heat storage per cubic foot is nine times greater than you can get with water. The system appeared excellent, but after a few years the sodium sulphate became fatigued and ceased to recrystallize as it should have done. This posed a problem, which has to some extent been overcome by adding suitable nucleating agents.

Chemical change of state is different, and there is quite a lot of work being done on the possibility of chemical storage of solar energy by which certain chemical compounds are converted and then re-combined later with the production of energy. There is a very great field of opportunity here if suitable reactions can be discovered.

THE HONBLE. MRS. HUGH CARTER: Given that the walls of a reservoir are insulated as well as possible, how large would that reservoir have to be before it could store enough heat to keep a six-bedroom house warm for the whole winter?

THE LECTURER: I hesitate to do arithmetic in public, as it is always wrong; such water storage would have to be very large, though not impossibly so. An experimental solar house in Canada, has a basement full of water which is about the area of the house and, speaking from memory, about six or eight feet deep. I do not know whether this would hold enough heat for the whole winter, but it would help to a large extent. However, the question raises an interesting point and I will work out the figures for the written discussion.

[*Dr. Heywood has written the following additional note, in pursuance of the above:*

For the following calculations I have taken a house with a ground-floor area of 1,200 sq. ft. and a collector area of 500 sq. ft. on the roof.

Assuming that 2 therms of solar radiation are incident upon each square foot of collector area during the summer, and the efficiency of collection is 60 per cent, then:

$$\text{Total heat collected} = 2 \times 500 \times \frac{60}{100} = 600 \text{ therms}$$

It is interesting to compare this figure with the heat supplied to such a house if 5 tons of coal and coke were used during the year.

The heat equivalent of this fuel amounts to 1,500 therms, but allowing for efficiency of combustion, it is unlikely that more than 700 therms would be effective. Thus it is a possibility for summer radiation to supply a considerable proportion of the winter heat needed.

However, the storage space required works out to a rather startling figure. Allowing a temperature rise of 50° F., then the water storage should be $\frac{600}{50} \times 100{,}000$ lb.

$$= \text{approximately } \frac{600}{50} \times \frac{100{,}000}{60} \text{ or } 20{,}000 \text{ cub. ft.}$$

and if the base area were the same as that of the house the depth would be 17 ft. This calculation does not allow for heat losses, nor for variation in the efficiency of collection at different solar radiation intensities. The design of the Canadian solar house referred to at the Meeting was described in a paper by E. A. Allcut and F. C. Hooper at the U.N. Conference 1961. The house has not yet been constructed, but the storage water reservoir has the same base area as the house and a depth of 14 ft., which is of the same order as calculated above.]

THE CHAIRMAN: On your behalf I will thank our speaker for a most interesting paper. To me it has been most illuminating, because I really had not realized that solar energy was being used to any extent for heating purposes or producing power. I take it, Sir, that the greatest scope for development is in countries which have a lot of sunshine and where there are no other indigenous sources of energy, no coal, no oil, so that these are too dear for the inhabitant. In such places it might be possible to harness this energy to the extent that it would be available and useful in cooking and heating.

Ladies and gentlemen, let us give most hearty thanks to Dr. Heywood for his address.

The vote of thanks to the Lecturer was carried with acclamation, and the meeting then ended.

GENERAL NOTES

TAGORE CENTENARY: UNVEILING OF A MEMORIAL PLAQUE

[*M. A. Hossain*

The picture above shows the unveiling of the memorial plaque to Rabindranath Tagore which took place at 3 Villas-on-the-Heath, Vale of Health, Hampstead on 19th October, by permission of Mr. Maurice Cole, the owner of the house. As announced in the last issue of the *Journal*, the plaque has been erected by the London County Council at the joint request of this Society, the Royal India, Pakistan and Ceylon Society, the East India Association and the Royal Commonwealth Society, who together organized celebrations to mark the centenary of Tagore's birth in May of this year.

Included in the photograph are (from left to right) Mrs. Norman Bentwich, representing the London County Council; the Acting High Commissioner for India, Mr. T. N. Kaul; Lord Spens, President of the East India Association (holding the cord); the Mayor of Hampstead (Councillor Bernard West), and (in profile) the Chairman of this Society's Council, Lord Nathan. The Royal India Society was represented at the ceremony by Mr. C. E. Lawson-Reece, a Member of its Council, and the Royal Commonwealth Society by Sir John Macpherson, the Deputy Chairman. Mr. and Mrs. Cole received the company and showed them over the house.

In his opening speech the Mayor spoke of the pride which the people of Hampstead took in the illustrious names of past residents associated with their borough, and he expressed the belief that the new plaque commemorating Tagore's visit in 1912 would serve as a reminder of the very great bonds of friendship which existed between India and Great Britain in the Commonwealth. Lord Nathan, who spoke next, recalled that the Society of Arts had begun this practice of erecting memorial tablets to famous men and women, and referred to the Society's efforts over many years to make the various sides of the life and culture of India better known in this country.

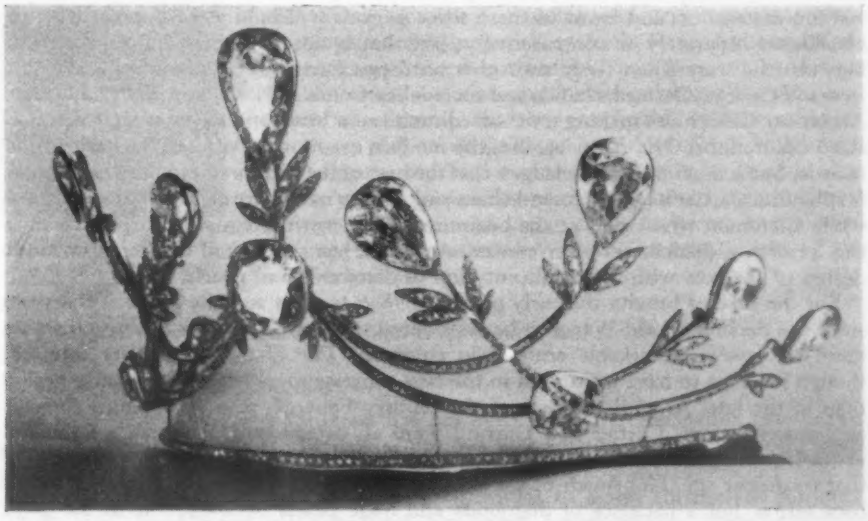
The act of unveiling was performed by Lord Spens, who emphasized the reasons which brought Tagore to this country in the years immediately before the First World War: he came, said Lord Spens, as an apostle of goodwill and understanding —a gospel which he preached and performed all his life.

In concluding the proceedings, the Acting High Commissioner described the erection of the plaque as an act of faith, for which he expressed the deep appreciation of the Government and peoples of India. He expressed thanks particularly to the four Societies, the London County Council, the Mayor and Mr. Cole.

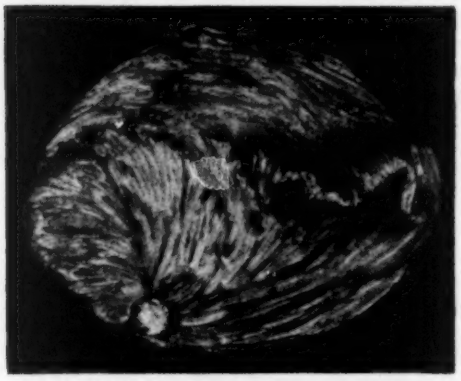
After the ceremony, the Royal Society of Arts gave a small luncheon party at its House for those chiefly concerned in the proceedings. The Chairman of Council presided.

INTERNATIONAL EXHIBITION OF MODERN JEWELLERY 1890-1961

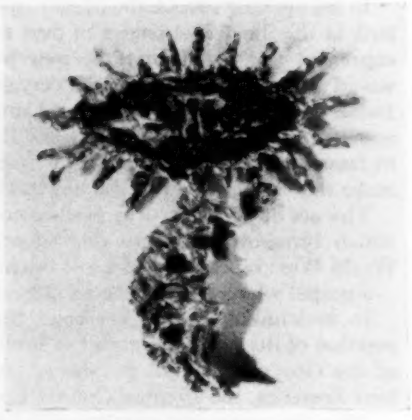
During the last decade the Worshipful Company of Goldsmiths has included among its activities in support of the craft to which it stands sponsor a splendid series of exhibitions, many of them mounted in the Company's own Hall in the City of London, many sent travelling up and down the country and on occasions overseas. On earlier occasions the emphasis has been chiefly on the silversmith's work or on collections in which important examples of silversmithing have been a principal ingredient. Now the Wardens and their assistants have turned their attention to jewellery, and with resounding effect.



Diadem of diamonds by Chaumet of Paris, 1904



Brooch of creased gold set with a diamond, by Bernard Meadows, 1961



Clip of yellow gold and silver mounted on wood, designed by Jean Lurçat and made by Patek, Philippe, 1961

The idea of this exhibition originated in the Victoria and Albert Museum in a plan to commission new jewellery designs from living British sculptors and painters and show them in the company of the Museum's collection of modern jewellery. In the event, the specially commissioned pieces and many examples from the museum collection have become the nucleus of a much bigger thing, the first great international exhibition of modern jewellery, for which private owners all over the world have unlocked their caskets and museums and galleries their cases with equal generosity.

The resulting collection of a thousand jewels is shown with dashing style by Alan Irvine in a setting of wild silk and prismatic allusion in agreeable contrast to the formal architecture of the rooms. It covers the years from 1890 to the present day and divides clearly into three periods punctuated by the two world wars. For many visitors the earliest and latest of these three periods will hold most interest whether considered separately or comparatively; but that is not to dismiss lightly the years between the wars when ivory and other semi-precious materials took such startling forms in Georges Bastard's hands and such delicate ones in H. G. Murphy's, and when Alexander Calder was making jewel-sized mobiles in brass and silver as well as room-sized decorations. Originality catches the modern eye more often than the flash of diamonds, but it must be acknowledged that the best of the diamond jewellery hereabouts is splendid. Cartier's long diamond chain and Asprey's tiara are elegant and restrained, while Chaumet, who could at the beginning of the century equal or surpass them in this vein in a diadem set with enormous stones, has vindicated the harsh unsubtle design of the '20s with a magnificent tiara of diamonds and pearls.

For the sake of brevity the early period of 1890 to 1914 and the latest of the years since the Second World War may be considered together, since this exhibition shows them to have a remarkable amount in common. The diamond is never eclipsed, though it seems to have been used to the best purpose more often in the early period than in the late. Around the turn of the century Fabergé, in a surprisingly delicate and graceful tiara, Cartier and Garrard were all using diamonds with a light and exquisite touch, while the tiara of 1910 lent by the Queen Mother is a triumph of that confident age. Not much of the present day can compare with this work on its own terms, but a necklace of diamonds and huge pearls by Bulgari is in the great tradition, and Gilbert Albert's necklace for Patek, Philippe uses quantities of diamonds with an elegance to match that of the early years.

Of more particular interest are two types of jewellery which occur with equal conviction in both the earlier and the later period: silver jewellery using direct and simple forms, with or without the other semi-precious materials; and gold jewellery, plain or with some gems, in which the chief interest is the sculptural use of the metal and the working of its surface with nuggety, creased or granular textures. Modern plain silver jewellery, particularly from Scandinavian workshops, is familiar and is often criticized for being more concerned with art than with fashion; but there is work here by Vapaavuori, Nanna Ditzel, John Grenville, Fred Farr, Frances Bieber and Naum Slutzky which one may admire without reservation—a pendant of pinched silver tubes by Slutzky is a triumph of economy in design—and compare with the silver jewellery of the early years of the century by Casanovas, Ismael Smith and Julio Gonzalez to the advantage of both periods.

The sculptural gold jewellery (some examples of this kind of work are in silver or bronze gilt) is among the best of the work of the present day and is well shown in a very fine group of jewels from Patek, Philippe, one set of which is designed by Lurçat and another by Gilbert Albert. Two other good examples shown among the jewels presented to the Goldsmiths' Company's collection by De Beers come straight from sculptors' hands—the bracelet of faceted chunks of gold by F. E. McWilliam and the brooch by Bernard Meadows with an intricately creased surface set with a single diamond. Another group of very beautiful jewels by Arthur King carries further this sort of richness of sight and touch by setting baroque pearls in complicated gold; and Roy King for Garrard achieves a comparable richness in a bracelet and earrings in flexible gold, diamonds and enamel—another accession to the Company's collection by the gift of De Beers.

Pendant of parallel silver tubes by Naum Slutzky, 1931

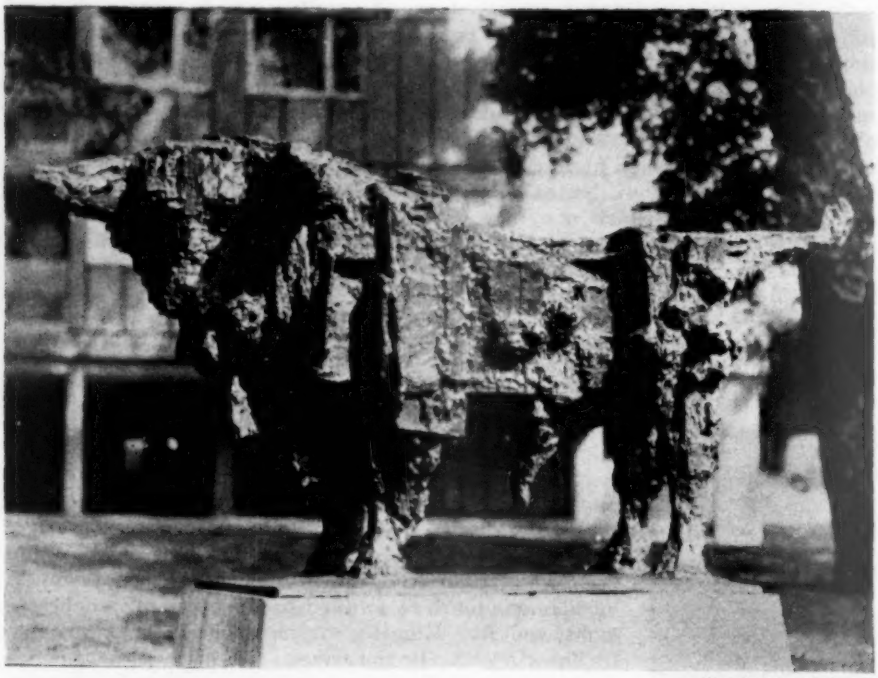
A selection which has not mentioned the work of the Pomodoro brothers, Frances Bieber, Louis Osman or William Haendel is too brief to be useful, and even so this note has found no space for much of the best work of the early years—for the fascinating and very important place of Art Nouveau in jewellery with René Lalique as its greatest exponent; for a necklace and pendant by Arthur Gaskin which are triumphant vindications of the Arts and Crafts movement; for the wonderful craftsmanship of Giuliano, the small gold sculpture of Emil Nolde and Emil Prouve which so exactly foretells the work of to-day, or the titanic personality of Alfred Gilbert, whose almost Newtonian powers of using chaos to create order seem untamed by the smallness of the physical scale of the jeweller's work.

R. Y. GOODDEN

(*The Exhibition is on view at Goldsmiths' Hall until 2nd December.*)

NEW SCULPTURES FOR LONDONERS

It is surprising that more interest has not been taken by responsible newspapers and television producers in the new sculptures that have sprung up in recent years in a changing and challenging new London. Never before in any capital city have so many questing sculptors had so many opportunities to assert themselves outdoors. Their aims need more publicity and intelligent interpretation, more especially perhaps for the benefit of tenants drafted into the new housing estates. The resentful



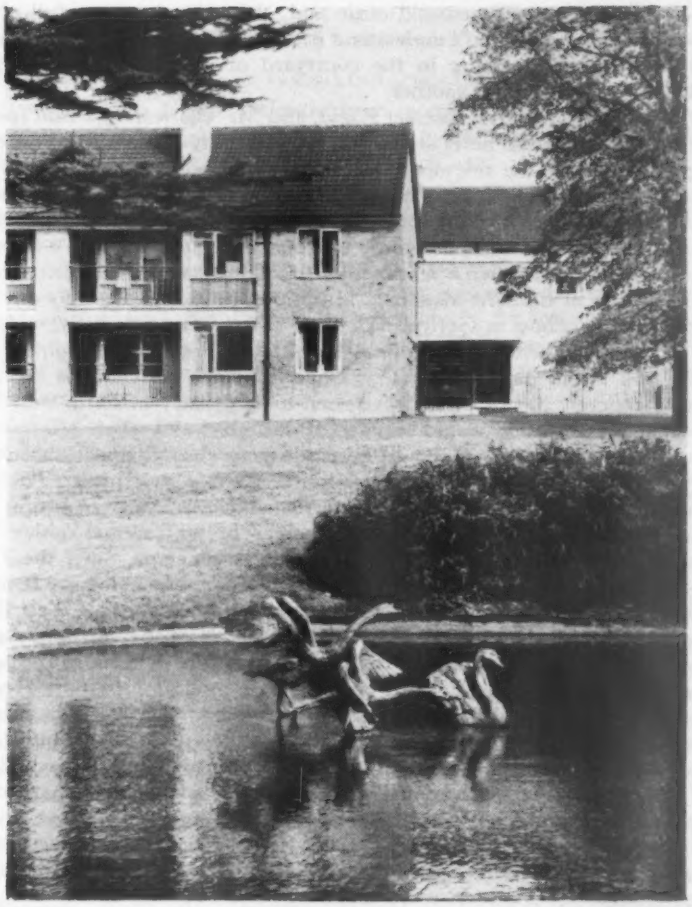
[*London County Council*

The Bull : *bronze by Robert Clatworthy at Alton Estate, Roehampton*

reaction of Roehampton's Alton Estate to the recently erected bronze bull of Robert Clatworthy is not an isolated instance. The tenants remain mystified by the attempt of this significant young sculptor and teacher at the Royal College to discover a sculptural equivalent for the sheer physical power of the brute, and blind to the imaginative siting of this massive, craggy quadruped in relation to one of the towering 'point-blocks' on stilts. The object is unwanted and unexplained.

Fellows of this Society, who recognize far more clearly than most the enrichment of statuary in austerely functional settings, may have missed the recent short-lived exhibition of photographs and models by a score of officially favoured sculptors, representing the first fruits of the London County Council's scheme of *New Sculptures for Londoners*, arranged in the foyer of The Royal Festival Hall. The intention signifies far more than the variable achievement to date. It remains indeed an inadequate sum, the £20,000 which the L.C.C. has annually allocated since 1957 for modern sculptures and murals for its new estates, schools, and open spaces. But the Council's advisory body, commissioning works in consultation with members of the Art Panel of the Arts Council, is very clearly alive to its responsibilities. Already it has done well to introduce the recent achievements of Barbara Hepworth, Victor Pasmore, and Bernard Meadows (to mention a few distinguished names) to communities far larger than the West End gallery followings. Even so, many vexing problems still await solution.

Why, tenants' associations will ask, cannot a representative of theirs have a voice on the L.C.C. advisory committee so that a community may feel it has *participated* in its amenity and not been affronted by something unintelligible dumped by an unknown authority? The answer here is that sculptures on new estates may be



[*London County Council*

The Swans : *bronze group by Gertrude Hermes at the Ashburton Estate, Wandsworth*

commissioned long before the first settlers arrive. Building proceeds more rapidly than the cumbrous art machinery at County Hall, with the result that when the sculpture is eventually erected on its predesigned site it is often condemned as a wasteful 'afterthought' by occupants clamouring for refrigerators or children's playgrounds. It is a great pity that more sculptors will not discuss their works in the open, as Franta Belsky did to curious tenants at Bethnal Green, explaining very simply the reason for the stylization of his mother and venturesome child on their paved area, and dealing conclusively with the refrigerator plaint. Given the will to talk and to listen, the 'monstrosity' may in time become a mascot.

Schoolchildren are far more responsive to innovation, their fancies readily taken by significant abstraction, and guided by teachers. 'Fair', remarked a boy, regarding Georg Ehrlich's drinking calf in the courtyard of his Wandsworth school; 'but we like those with *holes* in them.' Of Willi Soukop's fragmented relief in pebbles, concrete,

and pieces of granite symbolizing *The Pied Piper of Hamelin*, not easy to read on a Camberwell wall, a twelve-year-old critic said, 'It's a lovely scene, full of life and colour. But the grown-ups won't understand it.' Henry Henghes' triple gliding forms, their polished bronze gleaming in the courtyard of a Lambeth school, instantly recalled Delta-winged craft to another.

To my mind, Mr. Henghes' abstract *Flight*, and Mr. Clatworthy's *Bull* (previously mentioned, and reproduced here) are among the few really distinguished acquisitions. But the point is rather the relevance, or otherwise, of all these works to their particular settings and communities. This has been thoughtfully contrived. The enigma of William Turnbull's *Sun-gazer* is as suited to youthful speculation and debate in a school courtyard as it would be wildly unsuited to that old people's home which has already taken Mr. Ehrlich's sentimental fountain-piece to its collective bosom. The angular forms of Bernard Meadows' sculpture rise as challengingly out of water before a progressive school as Gertrude Hermes' swans settle gracefully, with subtlest interplay of wheeling forms, on the pond shown here in our photograph.

Powerful and unflinching, however, is what sculpture must always be as foil to the towering concrete blocks which have risen most densely in south-west London. It is here that art education would seem most desirable, and where television interviews could play their part. It should be made very clear that naturalistic garden statuary would be inept and lost beneath these sheer precipices. The massive inventions of a Henry Moore are properly demanded, in turn requiring a much larger budget than the London County Council's present annual outlay. But we should not forget the patronage of many big business concerns. Since the *Time-Life* Company erected Moore's abstract symbols of the four seasons on its Bond Street façade, there has been increasing enterprise of this kind in London's West End.

No doubt many have become familiar with Epstein's exuberant family group in bronze, straining towards the Park outside Bowater House in Knightsbridge. Fewer may have remarked the enterprise of State House in mounting Barbara Hepworth's largest sculptural design, her *Meridian* of convoluted bronze bands, against its granite screen in High Holborn. Too few know that the great abstract bird in beaten copper relief on the Carlton Tower Hotel in Sloane Street is by Elisabeth Frink; or that Geoffrey Clarke, a young sculptor no less conspicuous, is responsible for the tapering bronze symbol of Electricity on Sir Basil Spence's 185-foot skyscraper, Thorn House, in Upper St. Martin's Lane. Officialdom and business alike are presenting our sculptors with any number of new and formidable problems. They deserve to engage our attention more often.

NEVILE WALLIS

SIR THOMAS LAWRENCE EXHIBITION

An exhibition of paintings and drawings by Sir Thomas Lawrence, P.R.A., is being shown in the Diploma Gallery of the Royal Academy until 31st December (admission 2*s*. 6*d*.). The exhibition covers all periods of Lawrence's art, but the most important of the 80 works on view are the series of 16 portraits of Allied Sovereigns and leaders commissioned by George IV, which have been brought from the Waterloo Chamber at Windsor Castle by permission of Her Majesty The Queen. These have not been exhibited as a group outside Windsor since the Lawrence Memorial Exhibition of 1830. Mr. Kenneth Garlick, of the Barber Institute, University of Birmingham, has chosen and arranged the works in the present display, and is also responsible for the thorough catalogue of them which is on sale at 2*s*. 6*d*.

FINLANDIA: EXHIBITION OF MODERN FINNISH DESIGN

A comprehensive exhibition of modern Finnish design, ranging from all types of household furnishings and goods to jewellery, is on view at the Victoria and Albert Museum until 7th January (admission 2*s* 6*d*). The exhibition has been organized by the Finnish Society of Crafts and Design, and its setting devised by Mr. Timo

Sarpavena, who is also responsible for a variety of the objects on display. Other noted designers represented are Alvar Aalto, Ilmari Tapiovaara, Uhra Simberg-Ehrström, Tapio Wirkkala, Kaj Franck and Toino Muona.

BUILDING CENTRE POST-GRADUATE TRAVELLING SCHOLARSHIPS

The Council of the Building Centre have recently announced a new scheme of post-graduate travelling scholarships, designed to encourage the study of building materials and equipment and building processes used in foreign countries. Two scholarships of £250 each will be awarded annually to two selected persons who undertake to travel together in order to study the same subject, or group of subjects, and subsequently to present a joint report.

This offer is open to qualified persons who have been engaged for not less than two years in architecture and building in Great Britain—whether as practitioners, teachers or researchers—and who are British subjects. An interesting feature of the scholarships is that the report to be submitted by the scholars on their return can be in a form suitable to make a Building Centre recorded technical talk. These talks are made freely available to societies and schools of architecture, surveying and building; thus the scholars will, in effect, be reporting their findings to large sections of the building industry.

Applications for the 1962 scholarships must be received before 1st January, 1962, by the Director, The Building Centre, 26 Store Street, London, W.C.1. Full particulars of the competition and entry forms will be supplied by him.

OBITUARY

MR. M. A. C. HINTON

Mr. Martin Alister Campbell Hinton, F.R.S., who died on 3rd October aged 78, was a noted zoologist who spent many years in the service of the Natural History Museum. He was Deputy Keeper in the Department of Zoology from 1927 to 1936, and Keeper of the Department from the latter year until 1945, when he retired.

Hinton's zoological interests centred upon whales and members of the rodent family. In 1915 he reported to the Colonial Office on G. E. H. Barrett-Hamilton's researches on whales in South Georgia. It was through his efforts that the Natural History Museum acquired, in 1927, its outstanding collection of 127 skeletons deriving from a single school of a rare species of whale which had been found stranded in the Dornoch Firth. In the economic sphere, Hinton's knowledge of rodents had especially valuable results: he was largely responsible for the success of the Ministry of Agriculture's campaign against the musk-rat in this country in the late 1930s. He was the author of many papers on geology, palaeontology and zoology, notably a group examining the results of the survey of mammals in India. Of his own published books the most important perhaps are *Rats and Mice as the Enemies of Mankind* and his monograph on *Voles and Lemmings, Living and Extinct*. For a number of years he also continued the publication of Barrett-Hamilton's *History of British Mammals*.

Hinton was elected a Fellow of the Royal Society in 1934, and became a Fellow of the Royal Society of Arts in 1948.

NOTES ON BOOKS

THE PENROSE ANNUAL. *Volume* 55, 1961. *Edited by Allan Delafons. London, Lund Humphries*, 1961. 42*s net*

Printing, once the only means of mass communication, now has many competitors, by which it is challenged and with which nevertheless it co-operates. The printed word has become inextricably entangled with sound, with vision, with the mechanical translations of these, and even with such unlikely subjects as radar. All of these enter into the editor's introduction to the present Penrose Annual.

Once upon a time printing was a comparatively simple matter of three well-tried

processes. The novelties reported in Penrose remained persistently around the corner, and seldom matured. The situation to-day is quite different. Settled ways and established processes are everywhere being actively questioned, even attacked, by new methods and new inventions, and the problem for the editor of Penrose is not to seek for novelties, but how to select the grain from the mass that is presented.

Mr. Delafons is abreast of progress in printing, and he has written an excellent and well informed introduction. It would be more readable if it were rather better written, and it would be better written if Mr. Delafons were to study the function of punctuation. His survey ranges over many forms of communication, from print to television, and further—the connection between education, advertising and television is only one of the facets of the intricate interdependence of communication in the modern world.

The editor has his Aunt Sallies, which he vigorously attacks—for example, the arrogance of those typographers who regard the author's words merely as the basis of the exercise, the lack of attention paid by designers to the function of print and the requirements of reading, the wearisome use of sans-serifs as a cliché for modernity. His emphasis upon the use of reason in typography is refreshing to those of us who had thought that we lived in a madhouse.

The articles that comprise the text of the annual are, as usual, balanced between the aesthetic and the technical. They vary considerably in quality. One on American book design is no more than a descriptive catalogue suitable for an exhibition. On the other hand, Beatrice Warde is apt, erudite and amusing on a subject that might seem too juvenile for Penrose—Walt Kelly's strip cartoons—but all print belongs to Penrose. Some other articles are in a minor key on more pretentious subjects, and diffuse where everything should be crisp and sharp. Some are so short that their titles are absurd—'Design and Printing in India' in two pages!

The technical articles are a little arid. Mr. Walter Tracy tilts learnedly and vainly at the American and Didot point systems, which he would like to supplant with something more logical; colour printing in newspapers is discussed, as it has been before, with no apparent advance to show that colour in your morning newspaper is less remote than it ever was; new developments in offset printing and dry offset (a form of letterpress) continue to excite discussion; novelties in process engraving and in gravure are examined in laboratory or experimental stages.

The principal emphasis of the 1961 annual is on education. The foundation of an institute of printing is urged, to confer professional status on printers of more advanced education in their field, and presumably—though this, of course, is not stated—to exclude those who do not satisfy the institute's examiners. Those of us who have to do with printers would be glad of a higher standard of competence and conscientiousness at a lower level, among compositors and machine men. This is the province of Mr. Ellis Thirkettle, who describes with restrained enthusiasm the splendid new buildings that are going up at the Elephant & Castle to house the London School of Printing and Graphic Arts, and he shows us how the various departments are planned.

The annual no longer includes the odd collection of printing examples that was customary; it vanished last year. It does include the usual mass of advertisements at the end, advertisements that no doubt help to give us so much for our money, bless them, though most of them are the usual ill-favoured lot.

SEÁN JENNETT

ROCKETS. *By Paul Adorian. London, Paul Adorian* (21 *Denmark Street, W.C.*2), 1961. 8*s* (or $1.25) *post free*

Not many of us, who are approaching a half century of years, can delve into our personal archives and rediscover much from our student days that will withstand the

cold light of modern publicity. Undergraduate exercises, particularly those of a scientific nature, rarely have the stamp of originality, still less of prophecy. To meet an exception is quite delightful, and Paul Adorian has had the felicitous idea of re-issuing his lecture, 'Rockets', which he read in January, 1929, to the Engineering Society of the City and Guilds College, when still a student there.

At that time, the late Sir Henry Tizard, scientist and gentleman, was Rector of Imperial College, and the reason which has prompted Adorian to take this unusual step can best be given by quoting from his own Foreword to the reprint:

> While there is little original matter in the paper, it is thought that it may be interesting to read this particular approach to rocket propulsion as presented more than thirty years ago.
>
> Following the reading of the paper I received considerable encouragement from the then Rector of Imperial College, Colonel Henry (later Sir Henry) Tizard, and largely on his suggestion I helped to form the Imperial College Gliding Club and visited Germany to learn about Gliding.
>
> The net proceeds from the sale of this re-print will be given to the Henry Tizard Memorial Fund. This seems appropriate in view of Tizard's pioneering work in connection with radar and jet engines and the encouragement he always gave to the application of scientific developments to industry.

In the first part of his lecture, Adorian described the elementary basic principles of rocket operation, and here we detect the engineering student's hesitancy to plunge directly into the use of Calculus, and this is understandable. What at first reading may appear naïve is really a young man demonstrating to himself, albeit subconciously, and to his audience that he really understands what Differential Calculus can do. He gets there in the end and generally makes the right deductions. To many of us to-day, these form our stock-in-trade, but thirty-two years ago they would certainly be pearls of wisdom to the interested few. If one bears this in mind when reading this part of the lecture it seems all the more fascinating.

Adorian heads Part 2 of his lecture 'The History and Development of the Rocket', but in reading it to-day, how truly prophetic it all was, and I feel compelled to quote his three concluding sentences:

> At present the rocket as used in a car or aeroplane is still regarded as a dangerous curiosity, just as the famous 'Rocket' Locomotive was, over 100 years ago. It is only about 30 (thirty) years ago, that in London, a man with a red flag had to walk in front of a motor car to warn the public. Just as the locomotives and the motor cars are now essential factors of our daily life, so in a few years time it is quite possible that rockets will shoot about unnoticed.

When Major Titov orbited the Earth seventeen times we were made aware of him by Press and Radio, but how many of us remember that something like a dozen satellites are orbitting around us now?

But to return to the text, one cannot but think that Adorian was a precocious young man. On a more modest scale he emulated the early German rocketeers, Von Opel and Valier, with whom he conducted personal correspondence. The snippets of correspondence which he reveals have even to-day an ominous ring and I can recall as a schoolboy reading British newspaper accounts in which attention was drawn to the military aspects of the German experiments. Certainly, protestations about working towards eventual space travel were treated with little less than scorn. To-day, thirty-two years after Adorian lectured to his student colleagues, much of what he said has come to pass. This span of time is only slightly longer than that preceeding his talk when a red flag had to be carried in front of a motor car. What will the next thirty years reveal? Fascinating reading now, Adorian's lecture will be even more so in 1991.

J. E. P. DUNNING

SHORT NOTES ON OTHER BOOKS

THE PRACTICAL DISPLAY INSTRUCTOR. *By H. C. Murrills. London, Blandford Press, 1961. 22s 6d net*

The sixth, revised edition of an illustrated text-book of proven value to students of shop window display and presentation.

RENAISSANCE EUROPE. *With an introduction by James Lees-Milne. Edited by Harald Busch and Bernd Lohse. With commentaries on the illustrations by Hans Weigert. London, Batsford, 1961. 45s net*

A further volume in the handsomely produced 'Buildings of Europe' series, containing 186 large photographs of Renaissance architecture from the later fourteenth to the early seventeenth centuries in Italy, Germany, France, the Low Countries, Spain, Portugal and England.

FROM THE JOURNAL OF 1861

VOLUME X. *20th December*

DEATH OF HIS ROYAL HIGHNESS THE PRESIDENT

It is with the deepest sorrow the Council record the death of His Royal Highness the Prince Consort, the President of this Society, which took place on Saturday the 14th instant, at Windsor Castle.

While the death of a Prince, distinguished by rare intellectual gifts and eminent virtues, is deeply lamented by the nation at large, his loss is more especially deplored by this Society, in whose proceedings he has ever taken a most active interest. Since his election as President, on the 2nd June, 1843, His Royal Highness has on all occasions been ready to aid the Society in its undertakings by the influence of his exalted rank and the sagacity of his vigorous mind, and under his guidance the Society has attained a position of usefulness, of which its past records, of a century's duration, afford no example.

The mighty movement of 1851, with its vast influence on the progress of human industry, was due to him, and although not personally engaged in the Exhibition of 1862, it is well known how deep an interest he took in its success. Without his judicious counsel and influential support it may truly be said that the Exhibition of 1862 would not have assumed a substantial form, and that Exhibition may be regarded as his last undertaking.

In the promotion of great objects the Prince was undismayed by novelty, and his judgment was tempered by a prudence which ensured success.

By his varied attainments, his refined tastes, his enlightened judgment, and his kindly sympathies, he became the honoured link between the Crown and science, art, and literature, the ready means by which every judicious measure for the promotion of the commercial and industrial interests of the country was brought under the notice and patronage of the Queen.

His Royal Highness had endeared himself to all classes of Her Majesty's subjects, by the continued exercise of qualities of singular usefulness, and by the devotion of his life to the best interests of his adopted country. He has been taken away, not too soon, perhaps, for his own fame, but in the midst of a career distinguished by services to the nation, the full value of which it is impossible yet to estimate.

Monday next, the 23rd inst., being the day appointed for the funeral of his late Royal Highness, the Society's House will be entirely closed, and no business transacted.

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Distinctions after a name which appears more than once are not repeated

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Some Activities of Other Societies and Organizations

MEETINGS

FRI. 1 DEC. Analytical Chemistry, Society for, at Manchester Literary and Philosophical Society, 36 George Street, Manchester 1. 2 p.m. R. R. Young and P. J. Harrison: *The design and construction of laboratories.*

Royal Institution, 21 Albemarle Street, W.1. Dr. E. B. Worthington: *The science of nature conservation.*

SAT. 2 DEC. British Interplanetary Society, at Royal Aeronautical Society, 4 Hamilton Place, W.1. 6 p.m. Dr. Bin Cheng: *The extra-terrestrial scope of international law.*

MON. 4 DEC. Commonwealth Institute, S. Kensington, S.W.7. 5.45 p.m. Richard Bowles: *Canada's treasure chest.*

Reinforced Concrete Association, at Birmingham & Midland Institute, Paradise Street, Birmingham. 6 p.m. B. Rhodes: *Recent developments in prestressed concrete.*

TUES. 5 DEC. Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester 3. 6.30 p.m. David Fox: *The Canary Islands.*

WED. 6 DEC. British Kinematograph Society, at Shell-Mex House, W.C.2. 7.30 p.m. L. Lockhart Smith: *Some aspects of film as a means of communication to industry.*

Building Centre, Store Street, W.C.1. 6 p.m. Discussion: *Colour: co-ordinated ranges for building.*

Newcomen Society, at Science Museum, S.W.7. 5.30 p.m. Dr. P. E. Halstead: *The early history of Portland cement.*

Radio Engineers, British Institution of, at London School of Hygiene & Tropical Medicine, Gower Street, W.C.1. 6 p.m. Discussion: *Possible uses of computers in medical diagnosis.*

Reinforced Concrete Association, at 94-98 Petty France, S.W.1. 6 p.m. L. R. Creasy: *Watertight concrete basements.*

Textile Institute, at Liverpool Cotton Exchange, Liverpool. 7.30 p.m. A. M. Alfred: *European economic integration.*

Victoria & Albert Museum, S.W.7. 6.15 p.m. John F. Hayward: *Renaissance jewellery.*

THURS. 7 DEC. Chemical Society, at Manchester College of Science and Technology, Manchester. 6.30 p.m. Dr. M. F. Perutz: *The structure of proteins.*

Radio Engineers, British Institution of, at Reynolds Hall, College of Technology, Manchester. 7 p.m. K. F. Slater: *Radar for civil aviation purposes.*

Refrigeration, Institute of, at Institute of Marine Engineers, 76 Mark Lane, E.C.3. 5.30 p.m. Dr. J. C. Fidler: *Developments in storage of fruits.*

Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. Sir Arthur Kirby: *Tanganyika triumphant.*

Victoria & Albert Museum, Kensington, S.W.7. 6.15 p.m. M. Jakobsen: *The face of Finland.*

FRI. 8 DEC. Engineers, Junior Institution of, Pepys House, 14 Rochester Row, S.W.1. A. F. Atkin: *The development of a modern interceptor aircraft.*

Royal Institution, 21 Albemarle Street, W.1. Dame Kathleen Lonsdale: *Restless atoms in solids.*

SAT. 9 DEC. Horniman Museum, London Road, Forest Hill, S.E.23. 3.30 p.m. H. R. Robinson: *Japanese Armour.*

MON. 11 DEC. Commonwealth Institute, S. Kensington, S.W.7. 5.45 p.m. Kenneth Bradley: *The Commonwealth in 1961.*

Transport, Institute of, at the Institution of Civil Engineers, Great George Street, S.W.1. 5.45 p.m. P. S. Henman: *The economics of goods transport by road.*

TUES. 12 DEC. Architects, Royal Institute of British, 66 Portland Place, W.1. 6 p.m. J. P. Eddy: *Professional responsibility.*

Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester 3. 6.30 p.m. Alan Rowe: *From the Pyrenees to Benghazi.*

Textile Institute, at Chemical Society, Burlington House, W.1. 6.30 p.m. Dr. D. W. Hill: *The work of the Shirley Institute.*

WED. 13 DEC. Analytical Chemistry, Society for, at The University, Edgbaston, Birmingham, 15. 7 p.m. Dr. W. T. Stephen: *Fluorescent indicators for the determination of metals.*

Mechanical Engineers, Institution of, 1 Birdcage Walk, S.W.1. 6 p.m. Anthony Bull: *Problems of commuter traffic in conurbations.*

Radio Engineers, British Institution of, at the London School of Hygiene & Tropical Medicine, Gower St., W.C.1. 6 p.m. Discussion: *Colour television.*

Radio Engineers, British Institution of, at The University, Drummond Street, Edinburgh. 7 p.m. J. B. Wilson: *Jodrell Bank.*

Radio Engineers, British Institution of, at The Walker Art Gallery, Liverpool. 7.30 p.m. M. W. Jervis: *Nuclear power station instrumentation.*

Royal Archaeological Institute, at Society of Antiquaries, Burlington House, W.1. 5 p.m. J. T. Smith: *The Romano-British basilican house and its problems.*

Victoria & Albert Museum, S.W.7. 6.15 p.m. John Lowe: *Architectural contrasts in Peru.*

THURS. 14 DEC. Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. Frank Giles: *Britain and Western Europe since 1945.*

WED. 20 DEC. Radio Engineers, British Institution of, at School of Management Studies, Unity Street, Bristol. 6 p.m. D. C. Carey: *Transistors in transmitters and communications receivers.*

THURS. 21 DEC. Locomotive Engineers, Institution of, at Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1. 5.30 p.m. H. Wilcock, W. E. Bulman & H. Simons: *The engineering aspect of catering on trains.*

Road Transport Engineers, Institute of, at Royal Society of Arts. 6.30 p.m. Open Forum: An evening of discussion.

Royal Commonwealth Society, Northumberland Avenue, W.C.2. 1.15 p.m. George Cansdale: *Animal wonderland—a visit to the Uganda National Parks.*

THURS. 28 DEC. & FRI. 29 DEC. Architects, Royal Institute of British, 66 Portland Place, W.1. 3 p.m. Christmas holiday lectures for young people. E. J. Carter: *London now and what it might be.*

FRI. 29 DEC. Victoria & Albert Museum, Kensington, S.W.7. 11 a.m. J. L. Nevinson: *Noah's ark.* (Children's lecture.)

OTHER ACTIVITIES

FRI. 1 DEC. Engineers, Junior Institution of, at Pepys House, 14 Rochester Row, S.W.1. 7 p.m. Films: *Handling loose materials & Mechanical handling in iron production.*

FRI. 1 DEC.—SUN. 31 DEC. Commonwealth Institute, S. Kensington, S.W.7. Exhibition: *Tanganyika attains independence.*

FRI. 8 DEC.—SUN. 31 DEC. Commonwealth Institute, S. Kensington, S.W.7. Exhibition: *Paintings by Patricia Target.*

MON. 11 DEC. Engineering Designers, Institution of, at Rutherford College of Technology, Northumberland Road, Newcastle-upon-Tyne. 7.15 p.m. Talk & Film, A. H. Goodliffe: *Oil refining.*

WEEK COMMENCING MON. 11 DEC. Commonwealth Institute, S. Kensington, S.W.7. Films: *Drums across the lagoon* (*Cook Islands*) and *Coral wonderland* (*Australia*).